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A flight of Army pursuit planes flying over the Columbia River in Oregon.

VOLUME XXIV NUMBER 19

Special Features

Airplane Spruce
The Fokker F-10
The Velie M5 Aircraft Engine

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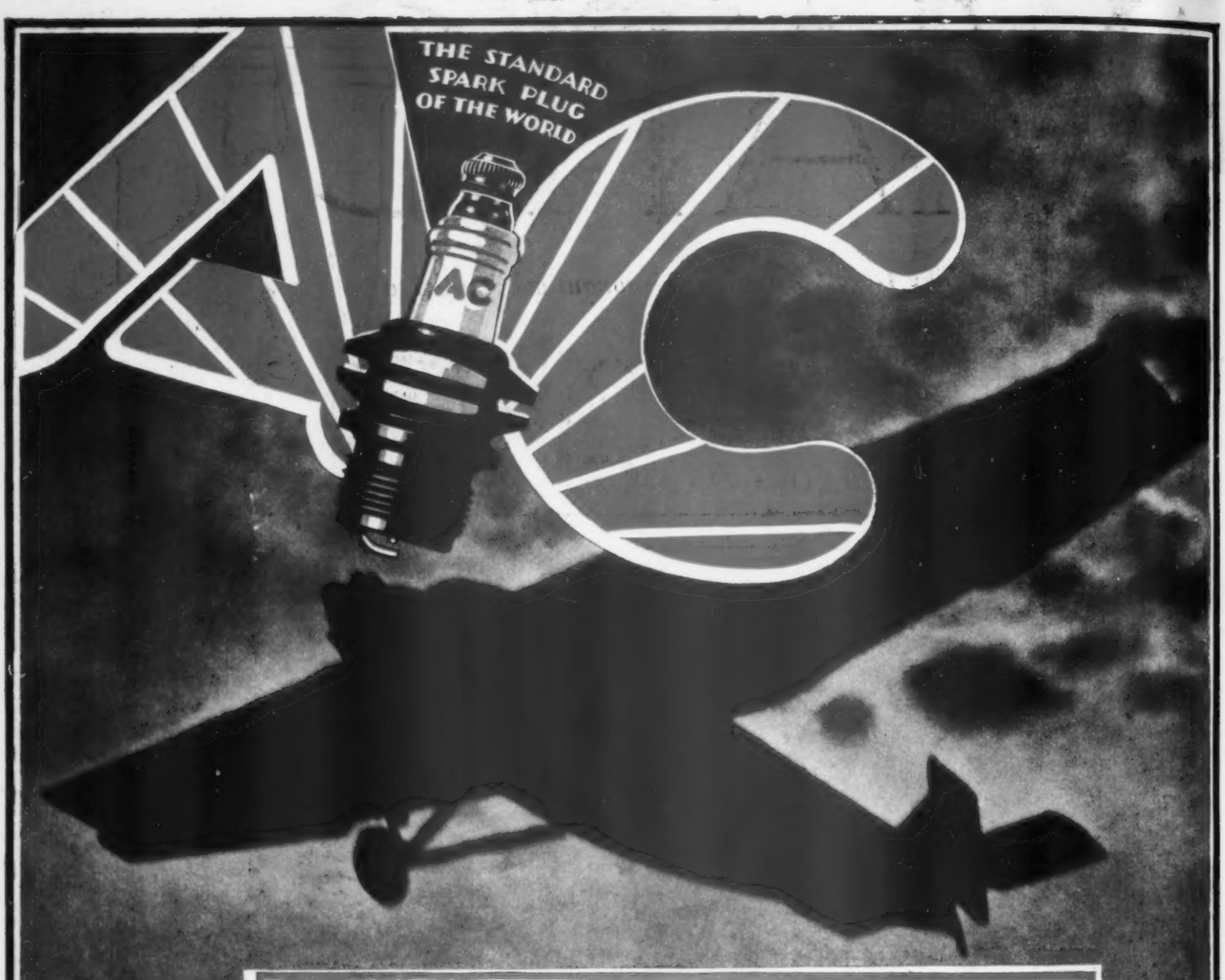

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HOURLY OPERATING EXPENDITURES

	Whirlwind per hour	Ox per hour
1. Engine depreciation Whirlwind at $4,910 cost—1,500 hrs. life	$ 3.27	$ 1.00
2. Oil and Gasoline	5.00	3.00
3. Overhauls Whirlwind every 250 hrs. @ $250 cost	1.00	
Ox every 100 hrs. @ $200 cost		2.00
4. Pilots hourly rate of pay	5.00	5.00
Total Hourly Operating Expenditures	$14.27	$11.00

YEARLY OPERATING EXPENDITURES

	"Cabin 'plane" per year	"Cockpit 'plane" per year
5. Airplane depreciation—20% of airplane without engine	$ 1,614.00	$ 440.00
6. Pilot's base pay	2,600.00	2,600.00
7. Half-time of $60 per week mechanic's service	1,560.00	1,560.00
8. Annual overhaul	1,000.00	600.00
9. Insurance — fire, crash, etc., @ 20% value of complete 'plane	2,596.00	540.00
10. Allowance for crash losses exempted from coverage by "deductible" clause of insurance policy	600.00	500.00
11. Rent of hangar and use of field for "hopping"	1,500.00	1,500.00
Total Yearly Operating Expenditure	$11,470.00	$7,740.00

TOTAL OPERATING COSTS

	"Cabin 'plane" per hour	"Cockpit 'plane" per hour
12. Hourly expenditures	$14.27	$11.00
13. Yearly expenditures divided over 700 hrs. flying	16.39	11.06
Total Cost per Hour	$30.66	$22.06
14. Cruising speed in miles per hour	100 m.p.h.	70 m p.h.
15. Net pay load in pounds	1000 lbs.	410 lbs.
16. Total cubic feet of package space, including cabin, etc.	130 cu.ft.	25 cu.ft.
Total Cost per Mile Flown	$0.3066	$0.3151

PASSENGER COSTS

17. Cost per passenger per 100 miles (assuming full load)	$7.66	$15.75

PACKAGE COSTS

18. Cost per 100 lb. packages per 100 miles (assuming full load and 3 hrs. gasoline)	$3.07	$7.68
19. Cost per cubic foot of space per 100 miles	0.236	1.26

"HOPPING" COSTS

20. "Hopping" passengers carried per hour, assuming 3½ flights of 10 to 12 minutes each	14	7
21. Cost per passenger (assuming full load)	$2.19	$3.15

★These figures comprise the composite operating expenses of several of the largest air taxi operators in the East. They do not, however, include executive overhead, contingencies and business-getting expenses. In studying these figures, therefore, it should be realized that organization and operating conditions vary considerably.

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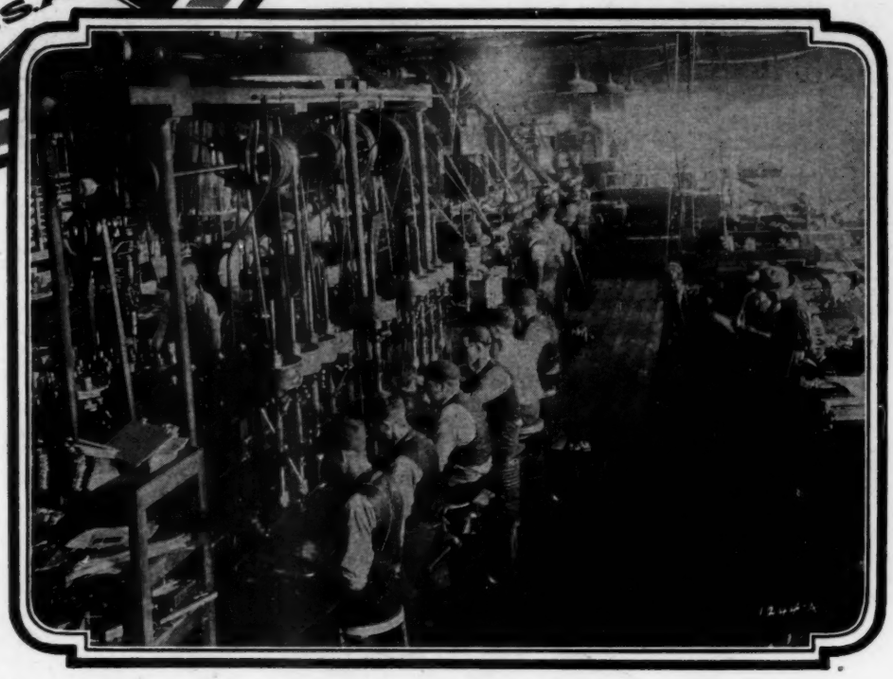

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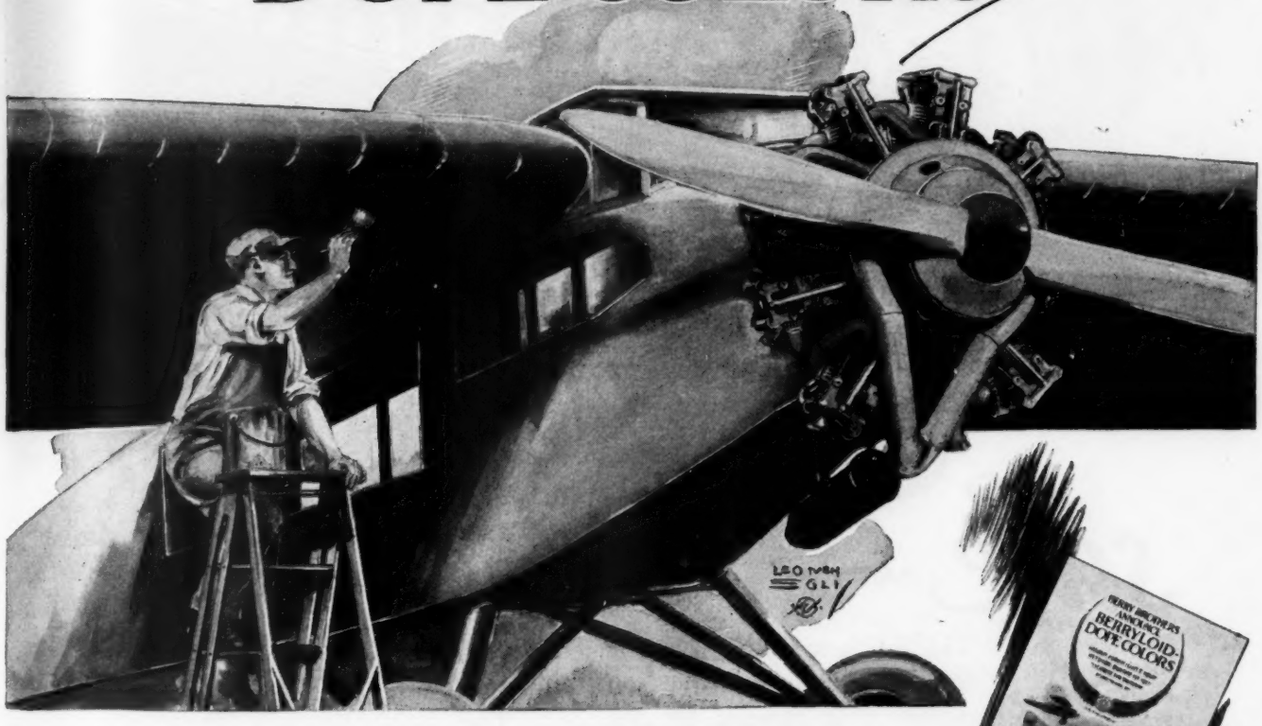

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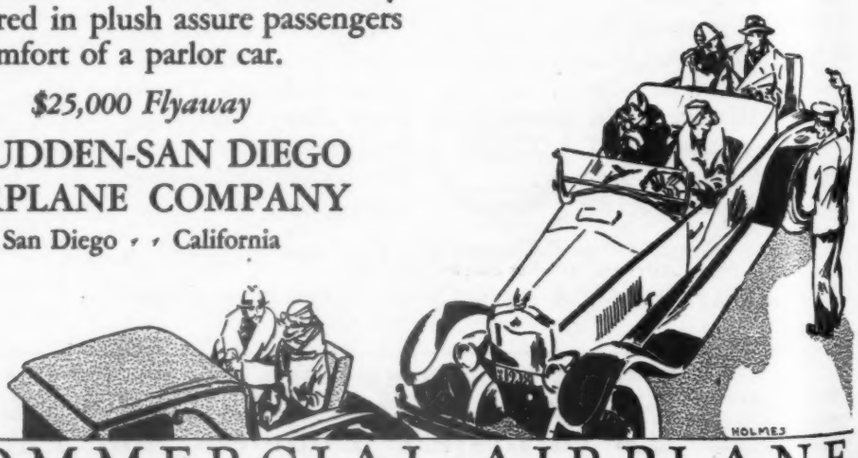

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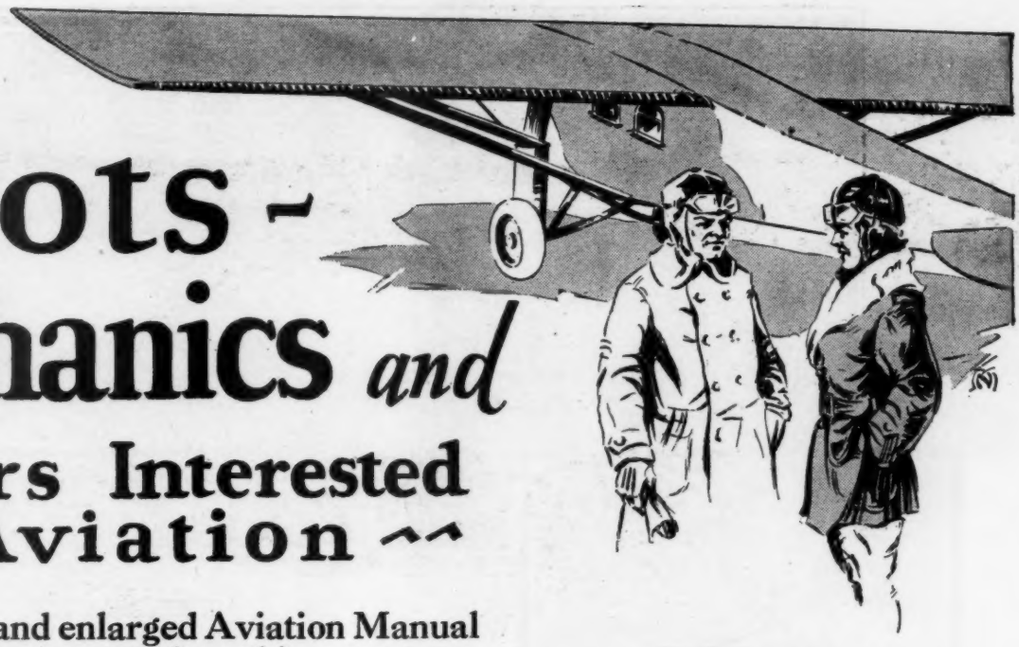

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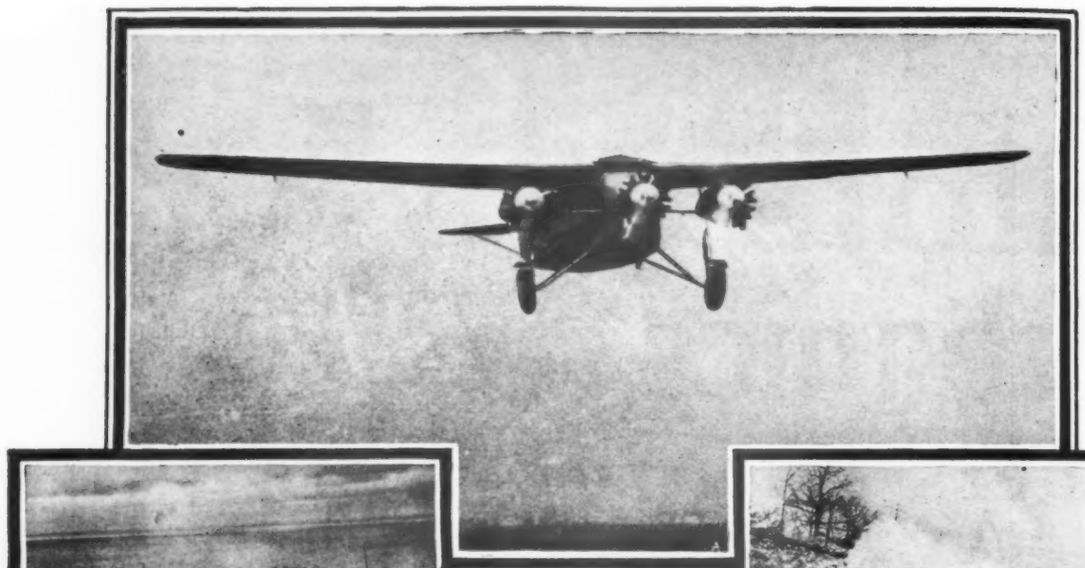

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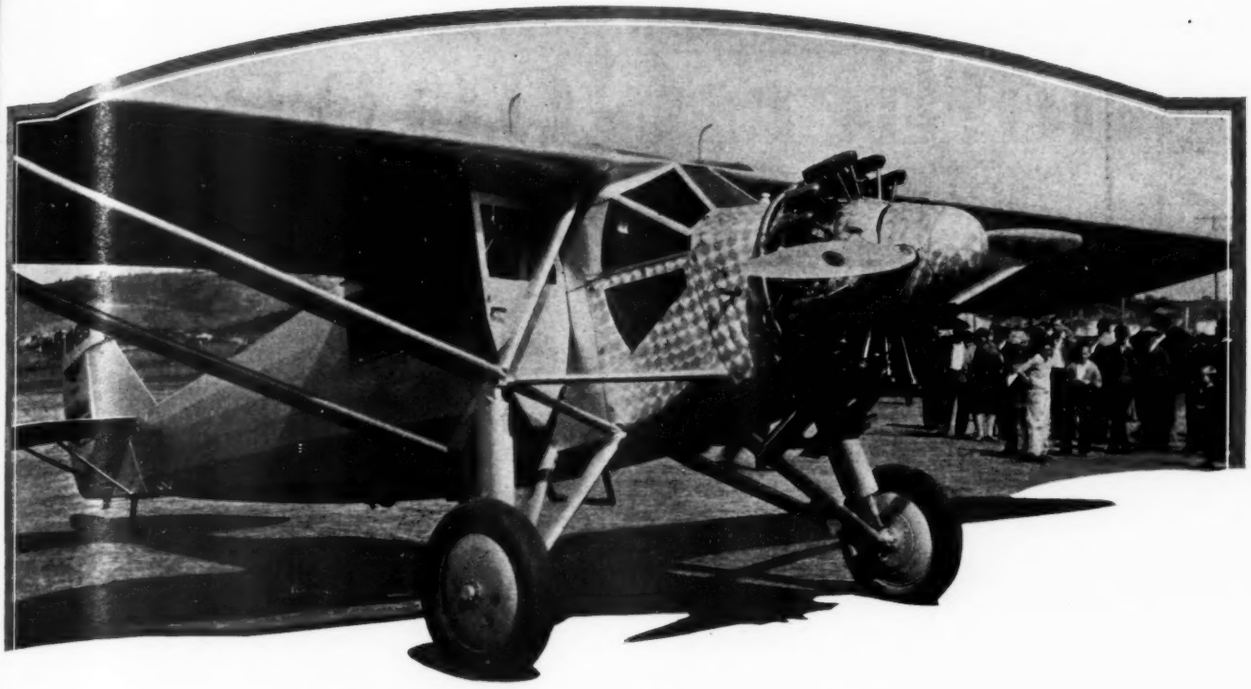

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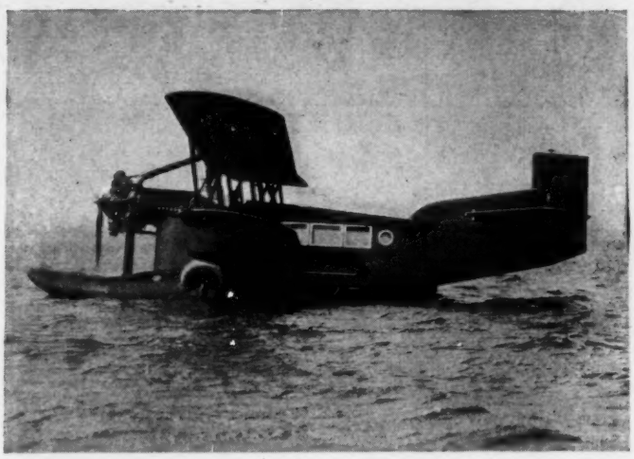

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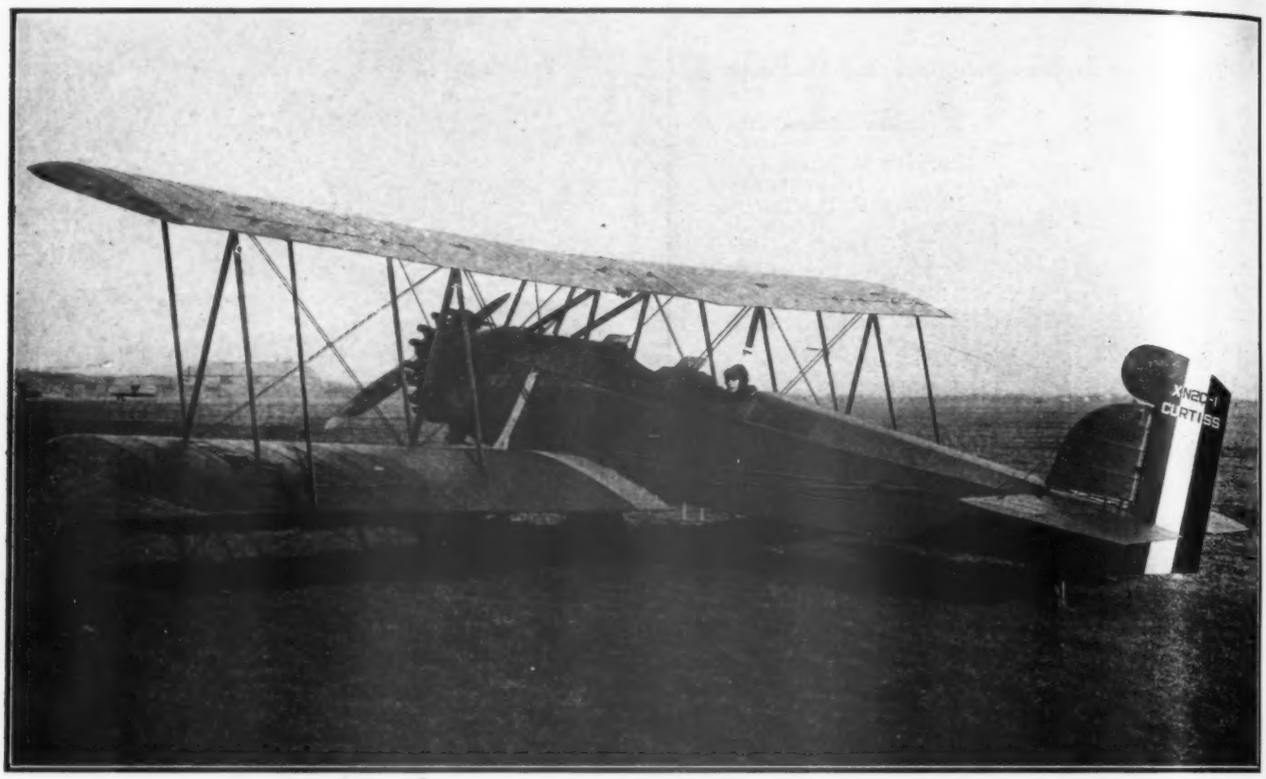

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Vol. XXIV | *MAY* 7, 1928 | No. 19

One in a Million

THE DEATH of Floyd D. Bennett is not only mourned by all those who knew and admired him, but by the entire aeronautical world. It has been airmen like Bennett, possessed of exceptional flying skill, courage and loyalty to the cause, who have done the major part of the work in the task bringing aviation into its own. From the day he enlisted in the Naval Air Service as an aviation mechanic until the time he passed on to the airman's Valhalla he devoted all of his effort and energy toward the development and progress of aeronautics in this country. The sincerity of that devotion is all the more exemplified by the fact that, like others who went before him, Floyd Bennett in the space of a few short years rose from total obscurity to a well earned place in the aeronautical sun.

Perhaps his greatest quality, and incidentally the one that lead to his death, was his loyalty to the fraternity of the air. In an attempt to assist the crew of the Bremen in getting their stranded plane off the frozen wastes of Greenely Island, he left his bed in a Detroit hospital, where he had been confined with influenza, to accompany Bernt Balchen on an aerial relief expedition. His strength however was not as great as his splendid spirit and at Murray Bay he was forced to give up the venture.

That was his last flight; his last superb contribution to the cause of aviation. Floyd Bennett has gone, but in our memory he will always remain, just as Commander Byrd, his friend and chief, once described him .... "a real man, fearless and true—one in a million."

The Cost of Refinement

PRACTICAL EXPERIENCE rather than great engineering resources has been the important factor in designing most of our commercial planes. By watching what others did and by copying, improving or changing what had already been built, America has produced a series of commercial aircraft which are remarkably efficient. Up to the time when the Department of Commerce started to demand stress analysis many of these planes were built and manufactured with practically no drawings to go by. The men who designed them often had little technical education besides that which they had given themselves.

The situation, however, has begun to change considerably. The Department of Commerce will not accept the fact that a fitting "looks" to be the right size, but demands that the size be based on stress analysis, which is certainly the better way, provided that the stress analysis be correct. Also, the better performance demanded of planes can only be brought about by refinements both aerodynamic and structural. This means that there can be no guess work with an allowance on the heavy side. Everything must be calculated down to the last detail. In the matter of the aerodynamic qualities, the question of weights and areas must be brought down to a fine point and this can only be done if the plane is scientifically engineered.

A few years ago an experienced flier with a good eye for proportions and a little engineering knowledge could design as good a plane as the next one, but this is no longer true. The present day designer must compete with the experience and with the scientific data which has been gathered through many years. To build a better plane than those which are flying today takes both genius and engineering knowledge. If some of those who desire to break into the aircraft field would only realize this they would save themselves much money and many valuable lives. The inexperienced amateur and even the trained engineer should certainly have his design checked over by a competent engineer, both aerodynamically and structurally before he tests it out.

Reliability in Instruments

THERE HAS been a gradual realization that instruments are more to be trusted in bad flying weather than are the human senses. Most pilots naturally resent this and many of them even refuse to believe it. It takes a practical demonstration, either in a hooded plane or in a whirling chair, to prove to most pilots that they cannot maintain level flight by instinct and that they must either see the horizon or use the instruments. Even when it has been demonstrated to the pilot that instruments are more to be trusted in bad weather than his senses, he falls back on the argument that the instruments are unreliable and that many good pilots have had disastrous crashes because they had in the back of their minds the feeling that their instruments were not working as they should.

To some extent, especially in the past, this argument has had some truth. It is better to have no instruments at all than instruments which do not operate properly. It is up to the manufacturer to supply the best quality of instruments and it is up to the buyer to see that they are kept in proper operating condition. The best instruments built today are of such quality that they rarely get out of order, and as a rule they give a considerable amount of warning of impending trouble, so that if the pilot is careful he can tell whether his instruments need looking over in order to maintain them in good operating shape. If instruments do go bad the chances are nine out of ten that they are either of poor quality or that they have not been given the proper kind of maintenance.

The Fokker F-10

First of Three 12 Passenger W.A.E. Planes is Powered With Three "Wasp" Engines and has a High Speed of 148 M.P.H.

WHAT IS believed to be the highest powered commercial airplane ever constructed in the United States was recently completed by the Atlantic Aircraft Corp. at Hasbrouck Heights, N. J., for the Western Air Express. This plane, a Fokker monoplane designated as the F-10, is powered with three Pratt & Whitney 400 hp. Wasp engines. Following Fokker practice, it has a full cantilever wing set above the fuselage housing a large passenger cabin. The F-10 carries 12 passengers and approximately 480 lb. of mail or express in addition to two pilots, full fuel and oil tanks, and accessories. The disposable load is 4,950 lb. of which 2,640 lb. is pay load. With a gross weight of 11,500 lb., the plane has a high speed of 148 m.p.h. on three engines and 122 m.p.h. on two engines. It can climb 1,420 f.p.m. on three engines and 640 f.p.m. on two engines. It has a service ceiling of 18,000 ft. and a range of 600 mi.

Constructed Under Equipment Loan

The plane is the first of three for the Western Air Express to operate between Los Angeles, Calif., and San Francisco, Calif. They were constructed under an equipment loan granted to the Western Air Express by the Guggenheim Fund and were built in an effort to develop a model airway between these two cities. However, construction of the planes was not started until after Maj. C. C. Mosely, operations chief of the transport company, had returned from a tour of the principal European airlines. After his return, the final specifications were drawn up and construction started. The planes were completed in record time, practically three months after the completion of engineering data. The entire work was under the supervision of Alfred A. Gassner, senior project engineer for the Atlantic Aircraft Corp.

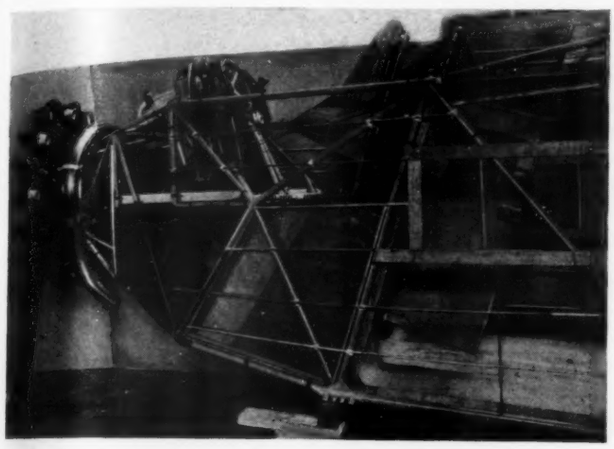
The coloring of the F-10, though quite simple, is distinctive. The wings, tail surfaces and engine nacelles are finished in silver, while the fuselage is red from the rear of the center engine compartment to the tail. The wood wing is protected by four coats of spar varnish pigmented with aluminum, while all fabric, such as the fuselage and tail surface covering, is protected by the standard doping process with a final flat finish in Berryloid lacquer. Metal parts, such as the steel tubing of the fuselage structure, are protected by a red oxide primer and finished with black Berryloid lacquer. However, where the tubes of the fuselage frame are exposed in the cabin, they are finished in aluminum.

Interior view of the cabin showing the seating arrangement.

The fuselage frame is constructed entirely of welded, seamless steel tubing and, contrary to the general tendency to use chrome molybdenum, the structure is of 10225 low carbon steel. The tubes are oxy-acetylene welded together, with all members meeting concentrically. Joints are reinforced only at critical points as where a number of tubes are joined or at points of concentrated loading; these joints are reinforced

Front quarter view of the three engined (Wasp) Fokker F-10 built for Western Air Express.

by pieces of sheet metal welded to the sides of the tubes. The tubes form a Warren truss extending as far back as the rear of the baggage compartment, behind the cabin. From there to the tail, the fuselage is braced with wire. Double piano wire is used with the wire looped through an angle of small diameter tubing welded in the corner of the joint. The trus-



Uncovered nose of the F-10 showing the center engine mount, pilots' cockpit, baggage or radio compartment and cabin door.

sing of the side panels is not quite symmetrical because of a high door on the left side at the rear of the cabin for the entrance of the passengers.

This door leads to a compartment directly behind the cabin. The right half of this is fitted as a lavatory, with a toilet in one corner and a wash basin in the other. The wall is fitted with a mirror, paper holder, and towel holder. A 20 gal. water reservoir is also provided. To screen the lavatory, there is a hinged door in the forward wall. This door serves a two-fold purpose: it can be swung back dividing the compartment into two parts with the lavatory on one side and a passageway for the entrance to the cabin on the other, or it can be swung forward forming part of the rear wall of the passenger cabin and leading to the lavatory, baggage, or mail compartments. Behind the lavatory section is the baggage compartment separated by a full size hinged door. The rear of this compartment is fitted with two low, lateral partitions which form a box for mail pouches or small baggage. This complete section has a capacity of 140 cu. ft. which is ample for the amount of baggage that may be carried. It is finished with mahogany plywood trim and nickel plated fittings, to match the cabin. Among these fittings are handles conveniently placed for one to grasp for support, if need be.

Passenger Cabin Rectangular in Shape

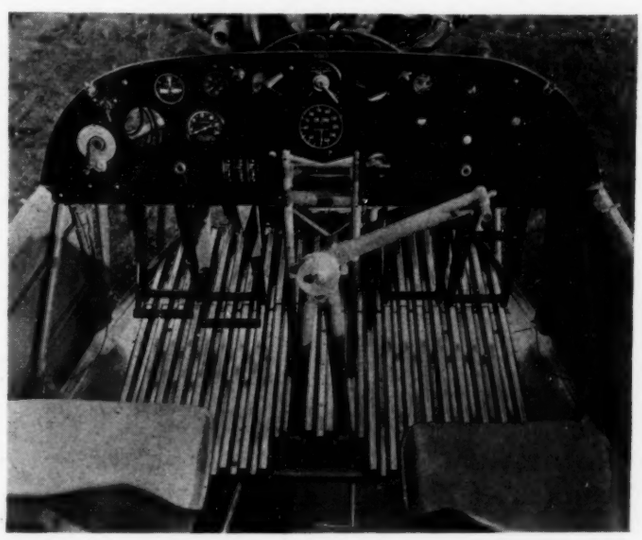
The passengers' cabin is large and free from all obstructions and bracing. It is rectangular in shape, 18 ft. 3 in. long, 6 ft. 1 in. high, and 5 ft. wide. Twelve heavily upholstered seats are provided, six on each side, with a wide aisle between. The seats are of wicker construction upholstered with gray velour. A pocket is provided in the back of each seat for the convenience of the passenger behind. Above each row of seats, near the ceiling, is a narrow shelf for clothing or small baggage. Should it be desired to use the cabin for other purposes, the seats can easily be removed leaving a clear compartment of 555 cu. ft. capacity. To match the seats, the upper walls and ceiling are covered with velour, while the lower walls, trimming, doors, and floor are of mahogany plywood. All fittings, such as the ash trays beside each seat, the four dome lights in the ceiling, the door handles, etc., are nickel plated. The cabin is exceptionally light and airy with glass windows at the sides extending the length of the cabin. The windows are of safety glass mounted in frames so that they can slide longitudinally. Clamps are provided to prevent the glass from vibrating.

For use in cold weather, an exhaust heater is connected to the cabin from the center engine. In addition, the walls, ceiling and floor of the cabin are padded with Balsam wool. This provides insulation against extreme temperatures outside, as well as deadening the noise of the engines. It is understood that a Pioneer air speed indicator and altimeter, fitted with large diameter dials, will be mounted on the forward wall of the cabin, in view of the passengers. In this forward wall there is a door leading to the pilots' cockpit that may also be used as an emergency exit from the cabin.

Wing Structure Electrically Bonded

The pilots' compartment, in front of the passenger cabin, is exceptionally large with a door at the rear leading to the cabin and one on the right for entrance or exit to or from the plane. The two pilots' seats are set quite high with a space between them in line with the door to the passenger cabin. Below the seats is ample room for a radio compartment or for storage of additional baggage. Though no provision has been made for the utilization of this cabin, it is expected that before the plane is put into service radio apparatus will be installed. Provision has been made for radio by electrically bonding the wing structure. The ceiling of this compartment, which really is the floor of the pilots' cockpit proper, is of corrugated duralumin resting on steel tubes, extending across the fuselage. The rear tube, which also acts as a brace for the pilots' seats, supports a step to facilitate entrance to the cockpit from the cabin.

Above the step and between the seats is a single control column hinged in the middle so that the upper end may be swung in front of either seat. It is fitted with a wheel control connected to cables that pass over pulleys at the hinge. The hinge can be locked, fixing the wheel in front of either seat so that there is no tendency for it to change its position



Pilots' cockpit showing control and instrument installations.

when the wheel is turned. Dual rudder pedals are provided, connected by cables to the rudder. The pedals are of the stirrup type and are supported from horizontal tubes behind the instrument board. Each pedal is fitted with hinged brackets so that when the bracket is swung in place it produces the effect of raising the pedal for use by a person of small stature.

In addition, the pilot's seat on the left can be raised or lowered. The adjustment mechanism is of the Army type,

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Airplane Spruce

Quality Sitka from the Pacific Northwest is Inspected Many Times Before Being Shipped to the Plane Manufacturers

By EDWARD M. MILLER

FROM THE Pacific Northwest, where spreads the nation's greatest stand of timber, comes the finest grade of Sitka spruce used in the manufacture of American and European airplanes. Adaptability of Sitka spruce for wing and fuselage construction is attested by the fact that a majority of American plane manufacturers are now using Sitka spruce in increasing quantities and have utilized this light, tough wood in a large percentage of recent trans-Atlantic and trans-continental record-breaking planes. By repeated tests, weight considered, Sitka spruce surpasses all woods in length of fiber, fineness of fiber, is the strongest, and the most free from hidden defects.

Selection and manufacture of airplane Sitka spruce is far more difficult and painstaking than might be supposed. The fact that a tree may bear the Sitka spruce label does not imply that airplane spruce of the proper quality is contained within its towering trunk. Some trees will fail to yield a single stick of superior grade airplane stock and the best of selected longs will yield only five or ten per cent. high grade lumber. Airplane spruce, of the better grade, is manufactured with the same care given to the production of sounding-boards for the finest American pianos, for violins, banjos, and other musical instruments demanding spruce free from all imperfections.

Present centers of Sitka spruce export are Portland, Oregon, Tacoma, Washington, and Grays Harbor, Washington. By far the largest part of the best spruce is manufactured at the Grays Harbor district on the central Washington Pacific coast. Grays Harbor is the world's greatest lumber shipping port, the shipments last year totalling 1,418,000,000 board feet with a value of $40,000,000.00. Tributary to Grays Harbor is the vast total of 55,000,000,000 board feet of standing timber, much of this being Sitka spruce on the Olympic Peninsula, Washington, where the government spruce operations centered during the World War. On the Olympic Peninsula is the nation's largest stand of untapped spruce.

Outstanding among the various airplane spruce manufacturing plants in the Pacific Northwest is the J. V. G. Posey Manufacturing Co. mill at Hoquiam, Washington, on Grays Harbor. Sales offices are maintained at Portland, Oregon. The Posey company is the oldest specialized spruce manufacturing concern in the Pacific Northwest, was the first company to manufacture airplane spruce on a large scale, and now enjoys the patronage of the majority of American plane concerns, as well as many European plane producing companies.

Packing airplane spruce at the Posey Mfg. Co. plant at Hoquiam, Wash.

Production of airplane spruce at the Posey plant came as a natural outgrowth of the firm's production of spruce for musical instruments. The firm was established 25 years ago

Continued on page 1321

Routed Sitka spruce airplane spars in process at the Posey Mfg. Co. plant.

Design *of* Wing Beams

Stress Analysis of Commercial Aircraft, Chapter Number Nine

By PROFESSOR ALEXANDER KLEMIN

Daniel Guggenheim School of Aeronautics

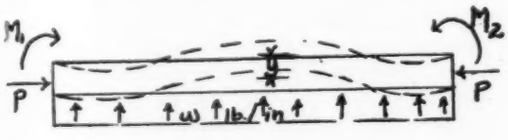
And GEORGE F. TITTERTON

Late of the Bureau of Aeronautics, Navy Department

WHEN A structural member is subjected to combined bending and compression, the stress at any section is the sum of the stresses due to bending and compression. It has been explained in Chapter 2 that when a strut deflects under side load (or bending load), the compressive end load increases the bending stress. The amount of this increase in bending stress is the compressive load P times the deflection y (Py). As the strut is stressed more it deflects more and the end load P times the additional deflection increases the stress and deflection still more. This goes on until a point of equilibrium is reached. To determine the bending stress at this point of equilibrium, we have to derive the Precise Formulas, whose use is recommended or required by all government departments.

Derivation of Precise Formulas.

Fig. 61 shows a beam supported at its end points, carrying a uniformly distributed load of w pounds per inch, an axial compression of P pounds, and moments M_1 and M_2 applied at the points of support.



Beam for Derivation of Precise Formulas

Fig. 61

The expression for the moment at any point X is:

$$M = M_1 + \left(\frac{M_2 - M_1}{L}\right)X - wLX/2 + wX^2/2 - Py \qquad (1)$$

Differentiating this expression twice with respect to X we have:

$d^2M/dX^2 = w - Pd^2y/dX^2$

Referring back to Chapter 2 we find that:

$M = EI\ d^2y/dX^2$ or $d^2y/dX^2 = M/EI$

Substituting above for d^2y/dX^2 and transposing the P term:

$d^2M/dX^2 + PM/EI = w$

Now we write $1/j^2$ for P/EI, j being an abbreviation for $\sqrt{EI/P}$

$d^2M/dX^2 + 1/j^2M = w$

The complete solution of this differential equation is:

$$M = C_1\sin X/j + C_2\cos X/j + wj^2 \qquad (2)$$

in which C_1 and C_2 are constants of integration.

Solving for C_1 and C_2:

When X = 0, M = M_1 and when X = L, M = M_2

$M_1 = C_1 \cdot 0 + C_2 \cdot 1 + wj^2$ since sin0 = 0 and cos0 = 1.

$C_2 = M_1 - wj^2$

$M_2 = C_1\sin L/j + C_2\cos L/j + wj^2$

Substituting for C_2:

$M_2 = C_1\sin L/j + (M_1 - wj^2)\cos L/j + wj^2$

Transposing:

$C_1\sin L/j = M_2 - wj^2 - (M_1 - wj^2)\cos L/j$

$$C_1 = \frac{(M_2 - wj^2) - (M_1 - wj^2)\cos L/j}{\sin L/j}$$

For simplicity, let us write:

$D_1 = M_1 - wj^2$ Then

$C_1 = D_2 - D_1\cos L/j/\sin L/j$

$D_2 = M_2 - wj^2$ and $C_2 = D_1$

Substituting the values of C_1 and C_2 back in Equation (2):

$$M = \frac{D_2 - D_1\cos L/j}{\sin L/j}\sin X/j + D_1\cos X/j + wj^2 \qquad (3)$$

which is an expression for the moment at any point, X, measured from the left hand support.

In Chapter 2 we learned that the maximum moment occurs at the point where the shear is zero. In the paragraph on "Further Relations" of that chapter we also found that dM/dX = S, that is the derivative of the moment M, is the shear, Then, to find the location of the maximum moment we differentiate Equation (2), equate to zero, and solve. Thus:

$dM/dX = 0 = C_1/j\ \cos X/j - C_2/j\ \sin X/j$

Dividing through by $C_2\cos X/j$ and transposing:

$$\tan X/j = C_1/C_2 = \frac{D_2 - D_1\cos L/j}{D_1\sin L/j} \qquad (4)$$

If we now solve Equation (4) for X, we will know the location of the maximum moment. X/j as obtained from this equation should be expressed in radians. If its value is found from trigonometric tables it will be expressed in degrees. The value of X/j in degrees may be converted to radians by dividing by 57.3. Thus radians = degrees/57.3. The value of X as determined from Equation (4) must lie between O and L. If the value of X obtained is greater than L, it is an indication that there is no maximum moment in the span and either M_1 or M_2 is the maximum moment on the beam.

The value of the maximum moment in the span may be found by substituting Equation 4 in Equation 3 and simplifying:

$M = D_1\tan X/j \cdot \sin X/j + D_1\cos X/j + wj^2$

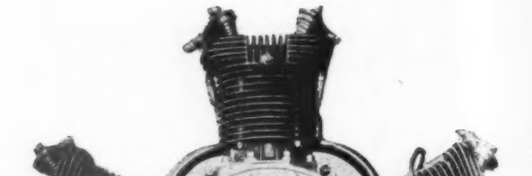
$$M = D_1\left(\frac{\sin X/j}{\cos X/j} \cdot \sin X/j + \cos X/j\right) + wj^2$$

$$M = D_1\left(\frac{\sin^2 X/j + \cos^2 X/j}{\cos X/j}\right) + wj^2$$

$$M = D_1/\cos X/j + wj^2 \quad \text{or} \quad D_1\sec X/j + wj^2 \qquad (5)$$

Continued on page 1314

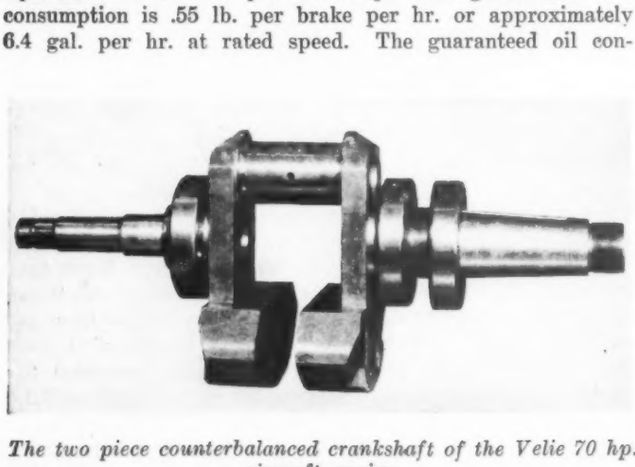
The Velie M5 Aircraft Engine



Front view of the Velie M5 70 hp. aircraft engine showing the Zenith carburetor.

VELIE MOTORS Corp., Moline, Ill., recently completed a five cylinder 70 hp. radial engine that is to be standard equipment in the Monocoupe produced by Mono Aircraft, Inc., a subsidiary of Velie Motors Corp. When Mono Aircraft, Inc., was taken over by the Velie Motors Corp., a short time ago, it was decided to build an engine specifically for that plane. Drawings were made and castings, machining, assembly, and preliminary tests were completed in record time; the complete engine from drafting board to its first test in the air took 30 days. The factory is now tooling up and expects to start producing five engines a day within the next 30 days.

The Velie M5 is of conventional design, having five static, radial cylinders, with all accessories and accessory drives in the rear. It is rated at 70 hp. at 1800 r.p.m. though it has developed 80 hp. at 2000 r.p.m. It weighs 210 lb., which is equivalent to 2.63 lb. per rated hp. The guaranteed fuel consumption is .55 lb. per brake per hr. or approximately 6.4 gal. per hr. at rated speed. The guaranteed oil consumption is .025 lb. per rated hp. per hr. or about .22 gal. per hr. These figures are estimated as, at the time of this writing, no actual block tests have been made. The figures were deduced by comparing the performance with a propeller on this and an engine of known power. However, with this engine installed, the Monocoupe is said to take off in three to five seconds, to cruise at 85 m.p.h., and to have a high speed of 100 m.p.h. carrying two people.



The two piece counterbalanced crankshaft of the Velie 70 hp. aircraft engine.

The M5 has five static air cooled cylinders having a bore of 4⅛ in. and a stroke of 3¾ in., giving a displacement of 250.6 cu. in. The compression ratio is 5.2. The combustion chamber is dome shaped with the cylinder head a Lynite casting with integral cooling fins. Set into the head are aluminum bronze valve seats, there being one intake and one exhaust valve per cylinder. The openings leading to these valves are in the rear while the two AC spark plugs are arranged diametrically opposite, one in the front and one in the rear. The cooling fins on this portion of the head, the top, are parallel to the slipstream, while those on the sides are concentric with the axis of the cylinder. On the block and in the air, the engine is said to operate at a very low temperature, which is perhaps due to this head construction, large fins, and valve arrangement. The head is attached to the nickel steel cylinder barrel by four ⅜ in. steel bolts. The barrel, like the head, is a casting with integral cooling fins. The sleeve of the barrel extends into the crankcase, reducing the overall diameter and at the same time eliminating the flow of excess oil directly into the lower cylinders. The cylinder barrel is fastened to the crankcase by eight studs which go through a flange cast integral with the lower portion of the barrel. This is reinforced by small ribs running parallel with the cylinder axis. A gasket between the cylinder and the crankcase insures a tight joint.

Pistons are Made of Lynite

The pistons are of Lynite with flat heads. They have two 3/16. in. Perfect Circle compression rings and one Perfect Circle oil scraper ring. The piston pin is full floating, bearing directly on the aluminum alloy of the piston head while operating in the bronze bushing on the connecting rod. The single piece master rod is of the big end type spun with babbit to provide a bearing for the crank pins. The four articulated rods are connected to the master rod by means of wrist pins. They are bronze bushed, oil being carried to all bearings under pressure.

The main crankshaft is of single throw design balanced with bronze counterweights. It is of the split type to permit assembly with the single piece master rod. The front or load end, which includes the crank pin, is mounted on two SRB ball bearings, the forward one taking the propeller thrust as well as the radial load. The propeller shaft is integral with this end of the crank. The shaft tapers and is fitted with a keyway, locating the hub, which is standard equipment. The crank pin telescopes into the rear section

Continued on page 1312

Facilities and Type of Field to be Shown By New Department of Commerce Ratings

A NEW airport regulation and classification system is shortly to be introduced by the Aeronautics Branch, Department of Commerce, it is reported. Furthermore, a new airport section to better serve municipalities planning and operating airports is to be established. Harry H. Blee, senior business specialist in the Aeronautics Branch, has been named by William P. MacCracken, Jr., assistant secretary of commerce, to head this section.

The new airport rating system to be used will enable the nature of the landing field to be ascertained by the letters and figures used in the designation. First place in the new classification is to be indicated by "A-1-A"—"A" meaning the field is excellent in general facilities, "1" that it is of good size, and the second "A" that its lighting equipment is of the best.

Second to this classification is the designation "B-2-B", with third place "C-3-C". Fourth place is to be rated "D-4-5-D", giving more leeway in size designation by the "4-5", and the fifth place, or landing field of smaller size and without facilities and lighting, is to be rated "6-X".

With this system in use, the type of airport can be easily determined by its rating, for the letters and figures are interchangeable to fit the facilities offered. Thus an airport of good size but second-rate in general facilities and lighting would be designated "B-1-B", while one which is excellent in facilities and size but third-rate in lighting would be "A-1-C".

Detroit Preparing for the Gordon Bennett Race, Reliability Tour, and Model Contest

WITH THE All-American Aircraft Show brought to a successful close, the aircraft events committee of the Detroit Board of Commerce is now preparing for three major undertakings of its 1928 program. These are the National Air Tour, James Gordon Bennett International Balloon Race, and the National Model Airplane Contest. All three are scheduled to start at Ford Airport June 30, and all will be managed by Ray Cooper, who conducted last year's program and the recent All-American Aircraft Show.

According to tentative plans, this year's tour will be the most extensive reliability test for American-made aircraft yet undertaken. It will cover a 6,000 mi. course and touch more than 20 cities in 13 states over a period of 28 days.

Look for Constant Progress

"The industry, and the people as well, are looking for constant progress in air travel," said the tour manager. "They would be disappointed if we did not eclipse the record of 1927 and preceding years. The first National Air Tour, four years ago, covered 1900 mi.; the second, 2,600; the third, 4,000; and this year we will travel 6,000. The difference in mileage represents a steady progress."

While the itinerary is not definitely fixed, here are the stopping points as they now line up: Indianapolis, St. Louis, Tulsa, Fort Worth, Houston, San Antonio, El Paso, Tucson, Phoenix, San Diego, Los Angeles, Fresno, San Francisco, Oakland, Medford, Ore.; Portland, Spokane, Missoula, Mont.; Great Falls, Mont; Minot, N. D.; St. Paul, Wausau, Wis.; Chicago, Battle Creek, Mich., and thence to the starting point, Ford Airport.

Prizes, in addition to the Edsel B. Ford trophy for the winner, will amount to $12,000 in cash, divided as follows: first, $2,500; second, $2,000; third, $1,750; fourth, $1,500; fifth, $1,250; sixth, $1,000; seventh, $750; eighth, $550; ninth, $400; and tenth, $300. The trophy and first cash prize were won last year by Eddie Stinson, in a Stinson-Detroiter plane.

The Detroit sponsors of the tour have built up an organization which will co-operate with local committees in perfecting arrangements, furnishing publicity, and in otherwise arousing popular interest. Local committees will be visited by Cooper and other officials on a pathfinding tour which is expected to leave Detroit June 1.

In figuring the score of individual entries, said Manager Cooper, contest load times the speed, over stick plus unstick, times 50 over the engine displacement will be the manner of calculation. In the speed, stick and unstick tests the maximum Department of Commerce approved certificate load must be carried. On the tour, however, competitors may reduce this load to 75 per cent. of the maximum, and credit will be given for 100 per cent. The maximum speed of entry planes will be obtained by sending them over a measured course fully loaded, although during the tour they will be required to maintain only 80 per cent. of their maximum speed, meanwhile being given credit for the maximum. Should they fall below the 80 per cent. their actual speed will be used.

To Begin Operation of New Mail Route Between Albany and Buffalo on June 1

ALBANY AND Buffalo will be connected by a New York State air mail route to begin operation June 1, according to a recent announcement by Postmaster General New. This will provide a trans-continental air mail service between Albany and intermediate points for connection with Cleveland, O., with the New York-San Francisco planes. The schedule provides that the plane will leave Albany at 10:30 A.M. and arrive at Cleveland at 4:35 P.M. It will arrive at Chicago, Ill., at 7 P.M. and at San Francisco at 5:35 P.M. the following afternoon.

The Colonial Western Airways, Inc., of New York City are the contractors for this route. The distance between Albany and Cleveland is 452 mi. each way, and the service calls for a daily trip except Sundays. Returning, the plane will leave Cleveland at 12:15 P.M. arriving at Albany at 4:30 P.M.

George R. White to Make Further Flight Attempts With New Improved Ornithopter

FURTHER ATTEMPTS to fly with a new ornithopter—a foot propelled, wing flapping, engineless flying machine—will shortly be made by George R. White of Stony Brook, Long Island, N. Y., at St. Augustine, Fla. White has taken a new and larger model of the machine in which he made trial flights at Cocoa Beach, Fla., last September to Florida for his new experiments.

Some 14 flights were made in the Cocoa Beach trials, the most successful of these carrying White for eight-tenths of a mile at an altitude of six to eight feet. White expects to better this mark with his new ornithopter, which he constructed during the winter in his Stony Brook laboratory.

Consolidated Instrument Co.'s "Pathfinder" Compass Now Used on Boeing Mail Planes

THE STAR "Pathfinder" compass, which is distributed by the Consolidated Instrument Co. of America, Inc., New York City, has recently been adopted by the Boeing Air Transport, Inc., for use on all of its mail planes. This compass is also used on the first of the three Fokker F-10 monoplanes, and it is understood it will be used on the others as well. These Fokkers, which are powered with three Wasp engines, will be used by the Western Air Express between San Francisco and Los Angeles.

Kinner Airplane and Motor Co. Constructs A New Two Place Parasol Type Monoplane

"THE SPIRIT of Ether", new monoplane built by the Kinner Airplane and Motor Co. of Glendale, Calif., for Dr. T. C. Young, chairman of the Aeronautical Committee of the California Development Association, has been successfully flight tested according to word from Glendale.

Mr. Kinner himself made the initial test flight. The plane left the ground within 100 ft. It is said to have attained

Front quarter view of the new Kinner monoplane powered with a standard Kinner five cylinder radial engine.

a high speed of 130 m.p.h. and has a cruising speed of 110 m.p.h. In climb and general maneuverability it is said to have performed very well.

The Spirit of Ether is a parasol type monoplane. It is of open cockpit type and seats pilot and passenger, there being an exceptionally wide door to the passenger's cockpit making it possible to step from the ground directly up into the passenger compartment. The wings of this plane are of folding type permitting storage in a space 12 by 25 by 7 ft. Wheel brakes and provision for a wheel at the rear makes it possible to taxi along ordinary streets when the wings are folded. The standard Kinner 5 cylinder radial is the power plant used on this plane.

Direct Air Mail Routes to be in Operation In 35 of the States by the End of June

BY JUNE 30 three-quarters of the States are expected to be served by air mail lines, according to routes scheduled for this fiscal year by the Aeronautics Branch, Department of Commerce. Direct air mail service will be available in 35 of the States, it is said.

Twenty-six States already are touched by the air mail lines, and five more will have routes passing through them beginning in May. Three states will be serviced shortly by routes already contracted for but not yet in operation, and one State now has bids out.

States which have cities on air mail routes now in operation are: Washington, Oregon, Idaho, California, Nevada, Utah, Colorado, Wyoming, Nebraska, Iowa, Texas, Oklahoma, Kansas, Illinois, Minnesota, Wisconsin, Louisiana, Indiana, Ohio, Pennsylvania, Michigan, New York, Massachusetts, New Jersey, Connecticut, and Missouri.

States which have cities on air mail routes to begin operation in May are: Alabama, Georgia, South Carolina, North Carolina, Virginia, and the District of Columbia. States which have cities on routes contracted but not operating are: Kentucky, Florida, and Montana. Bids have been asked by Tennessee for the operation of an air mail line, thus it is expected that Tennessee will shortly be added to the list.

Gillis Aircraft Corp. Builds Plane Designed By Professors at University of Michigan

A NEW cabin biplane has been designed by Profs. Edward A. Stalker and L. V. Kerber, members of the aeronautical engineering department of the University of Michigan at Ann Arbor, for the Gillis Aircraft Corp. of Battle Creek, Mich. The first "Crusader", as the plane is named, was recently given its test flights in Battle Creek before Henry A. Frese, engineering inspector for the Department of Commerce. Frese complimented the manufacturers on the plane's sturdy construction and performance.

This biplane is the first to be built in the City of Battle Creek. It will shortly be placed in production, it is said, to sell for approximately $8,000. The biplane is a four place craft powered with the Ryan-Siemens nine cylinder air cooled engine.

The plane fully loaded weighs 2,400 lb. It has a cruising radius of some 420 mi. and a service ceiling of 11,500 ft. The cabin is entered on either side of the plane through a rectangular door unobstructed by bracing of any sort. The rigidity of the fuselage about the door is maintained by a unique trussing design, genuine leather is used in the upholstery of the interior, and the wide vision windows are of unshatterable glass. Dual controls are provided. Both cabin and cockpit may be heated during cold weather flying, and provision is made for 100 lb. of baggage.

As AVIATION goes to press, Carl Gillis of the Battle Creek company is preparing for a cross-country flight to San Diego, Calif., in the new Crusader. After flying north to Seattle, Gillis intends to return to Michigan by way of Minneapolis.

Aircraft Industries, Inc., Now Building New Three Passenger Cabin Monoplane

A NEW cabin monoplane, to be powered with a 150 hp. Comet engine, is being constructed in San Leandro, Calif., near Oakland Airport by Aircraft Industries, Inc. It is a three place externally braced, high wing design with welded steel tubular fuselage and wood wings. It is to be fitted with dual control with a double seat in front and a single seat in the rear. The entire construction is conventional, though in some details it is quite original. The construction of the "Sierra", as the plane is to be called, is being carried out by the organizers of Aircraft Industries, Inc., namely A. R. Wild, Joe Long, and Joseph Berney.

Regarding the Make of Instruments in Use On Colonel Lindbergh's New Ryan Brougham

IN THE article entitled "B. F. Mahoney Company Turns Out a Special Brougham for Lindbergh" which appeared on page 1152 of the April 23 issue of AVIATION a mistake was made in naming the manufacturer of the instruments used on the plane. The tachometer, altimeter, air speed indicator, temperature gauge, air pressure and oil pressure gauges were all furnished by the Consolidated Instrument Co. of America of New York City. The running lights and the instrument panel lights were also furnished by the Consolidated company.

Bush Flying Service of Vancouver, Wash., Is Named Eaglerock Airplane Distributor

THE BUSH Flying Service of Vancouver, Wash., has been appointed Oregon distributor for Alexander Eaglerock planes. Planes of that type will be ordered at once for demonstration and for use in the Bush school. The company already has on hand Wacos and Travel Airs and all three will be used in instruction to give students a wider knowledge of flying.

Test Experimental Variable Camber Low Wing Monoplane at Mount Clemens, Mich.

AN EXPERIMENTAL variable camber, low wing monoplane was recently tested successfully at Mount Clemens, Mich. The plane has a closed cabin of considerable depth with full cantilever wings. The advantages of a variable camber wing are highly desirable. The camber of the wing is increased by having both the leading and trailing edges hinged, so that when high lift is required such as for take off or climb the surface can be dropped increasing the camber and thus the lift. For high speed conditions, where little resistance is desired, the surfaces are raised. These operations are controlled by a lever in the pilot's cockpit. The variable camber sections extend from the fuselage to a point about two-thirds the semi-span of the wing while the remaining third is fixed to the portion between the spars. This fixed portion may be raised or lowered and in that way the dihedral may be altered in flight. The plane is said to take off at 25 m.p.h. and attain a high speed of 100 m.p.h. Further details will be published in an early issue of AVIATION.

Bremen Fliers Feted in New York After Flying from Greenely in Ford Monoplane

AS AVIATION goes to press, Capt. Hermann Koehl, Maj. James Fitzmaurice, and Baron von Huenefeld, east-west trans-Atlantic fliers, are being fêted in New York City. Unable to fly the repaired Bremen from Greenely Island because of

Captain Koehl, Major Fitzmaurice, and Baron von Huenefeld receiving the greetings of the people of New York City as they ride up Broadway to the City Hall.

trouble with the engine, the fliers left that isolated spot on April 26 and flew to Murray Bay, Quebec, in the Ford relief plane piloted by Bernt Balchen.

From Murray Bay the three flew to Curtiss Field, L. I., N. Y., on April 27, taking a train to Washington, D. C., the same day to lay a wreath on the bier of Floyd Bennett, relief plane pilot who died of pneumonia in Quebec.

On April 28, the three returned to New York by train when foggy and heavy weather deterred Bernt Balchen from flying to Bolling Field, Washington, to pilot them back. Since that time the fliers have been the center of numerous ceremonies and celebrations, receiving the applause of the New York populace. From New York City they plan to go to Philadelphia, Chicago, and other cities.

Special State of New York gold medals have been awarded the fliers in New York City, and reports from Washington state that authorizations have been granted by bills passed by both Senate and House to President Coolidge to award Koehl, Fitzmaurice, and Huenefeld the Distinguished Flying Cross.

At this time it is not definitely known whether the Bremen will be flown from Greenely Island or whether a ship will be dispatched to bring it back with the coming of warmer weather. After the fliers left Greenely, the engine was again tested and made to run. Exposure and caking of grease in the engine, however, necessitate an overhauling. It is also possible that the crankshaft is slightly out of line as a result of the landing on the island.

Bill is Passed by House Which Authorizes Leasing of Public Lands for Aviation Use

THE HOUSE of Representatives has passed a bill authorizing the leasing of public lands for aviation purposes. The Secretary of the Interior is thus given authority "....to lease to any state or county, municipality, township, or other legal subdivision of a state for aviation purposes any contiguous public lands of the United States not to exceed in any case 640 acres."

The bill continues: "That said lease shall be for a period not to exceed 20 yr. and in the discretion of the Secretary of the Interior the subject to a renewal for a like period on condition that a rental of such sum as the Secretary may fix per year for the use of said land and shall be paid to the United States: *Provided,* That Government departments and agencies operating aircraft shall always have free and unrestricted use of said lands and, with the approval of the Secretary of the Interior, the right to erect and install upon said lands such structures and improvements as the heads of such departments and agencies may deem advisable, including facilities for maintaining supplies of fuel, oil, and other materials for operating aircraft, and that in case of emergency or in event that it shall be deemed advisable, the Government of the United States may assume absolute control of the management and operation of said lands for military purposes.

"The Secretary of the Interior is hereby authorized to grant permission, under such rules as he may prescribe, for the establishment of beach lights in aid of aviation upon any public lands of the United States, on tracts of appropriate size, and may withdraw lands for such purposes: *Provided further,* That the fees or other charges for use of any such aviation field or any of its facilities or service by anyone other than an agency of the United States Government shall be subject to review by the Secretary of Commerce."

Charles Froesch Named Project Engineer Of Atlantic Aircraft Corp. at Teterboro

CHARLES FROESCH, who has been connected with the International Motor Co. at Long Island City, N. Y., for the past five and one-half years, has resigned his position as engineer in charge of gas-electric bus design to join the engineering department of the Atlantic Aircraft Corp. at Teterboro Airport, Hasbrouck Heights, N. J., as project engineer.

This marks Mr. Froesch's return to aeronautical engineering, as his aircraft activities date back to 1912, when he was employed by the Farman Airplane Co. of France, later spending some time in Chicago on various aircraft developments, and then as inspector and aeronautical engineer in the United States during the World War.

Wm. Beardmore & Co., Glasgow, Scotland, Completes Largest of Military Airplanes

THE LARGEST military plane ever built was recently completed by Wm. Beardmore & Co. at Dailmuir, Glasgow, Scotland. The "Inflexible" is a braced wing monoplane with an overall span of 158 ft. It weighs close to 15 tons when fully loaded and is powered with three Rolls-Royce Condor engines, each developing 650 hp.

The Inflexible is said to have been designed by Dr. Rohrbach, the eminent German engineer. In construction it follows his usual practice of all metal construction with the covering of both wings and fuselage of flat sheet metal. Except for a few highly stressed fittings of steel, the entire

Newly built in Scotland, the Beardmore "Inflexible", powered with three Rolls-Royce "Condor" engines, is the largest of military planes. Compare the size of the man and landing gear wheel.

structure is of duralumin. The covering of the wings forms a tube or box which makes it into a rigid structure. This covering is laminated, with the number of laminations varying depending on the stress at that point. The wings have a very large dihedral angle and are supported by a single tension member from the lower part of the fuselage. On each side of the fuselage is a cantilever engine mount for one of the Rolls-Royce engines. The entire engine is in front of the wing, with the large, geared-down propeller far in front of the leading edge. The undercarriage is mounted below these engines and only one pair of wheels is used. They are 7 ft. 6 in. in diameter and fitted with Dunlop tires. Special tools and jigs had to be built to make the wheels, which were later tested to approximately 50 tons. The wheels are fitted with brakes, which is an innovation in British design. A wheel type of tail skid is employed.

Flettner Servo-Rudder Used

Before the plane was built there was a great deal of skepticism as to its controllability. The control surfaces, like the rest of the plane, are all made up of rectangular sections and are of full cantilever design. The rudder is balanced with a square horn type of balance, while to reduce the load on the rudder pedals, it is fitted with a Flettner servo-rudder. This consists of a small auxiliary surface in the rear mounted on the main rudder. It is actuated by the rudder controls in the opposite direction to that in which it is desired to turn the main rudder. The airstream deflects this auxiliary surface, which in turn moves the main rudder. From the photograph it appears that the ailerons are fitted with a similar device.

On its first flight the Inflexible was flown from Martlesdam Heath by Sq. Ldr. R. A. de Haga Haig, who was accompanied by a mechanic. The plane is said to have taken off after a run of approximately one quarter of a mile and was climbed to about 2,000 ft. The pilot then maneuvered gently for about 15 min. and brought it down. It is said to have stopped rolling after a run of about 300 yd. Presumably, the plane was lightly loaded, and because of the excessive wing area, lands very slowly. No figures are available at this time on the detailed weights, performance figures, or dimensions. The rectangular fuselage is said to be 12 ft. deep and fitted to carry 20 passengers.

Newly Formed Commercial Air Transport Of Rochester is Challenger Plane Agent

A NEW company, the Commercial Air Transport, Inc., has been formed in Rochester, N. Y. Edward J. Doyle is president; Otto Enderton, licensed transport pilot, vice president; George Roberts, secretary, and Dr. Hibbert Roberts is treasurer.

The new concern will operate Commercial Airport, a field lying five miles west of the city, and will act as agent for the Challenger planes manufactured by the Kreider-Reisner company of Hagerstown, Md.

The airport, 50 acres of level and naturally drained land, has an eight plane hangar with offices, locker room, work room, and parts room. A gasoline tank and pump also has been installed. Two planes will be available at all times for express and passenger service to all parts of the country. The city offices of the company are at No. 336 State St.

E. B. Meyrowitz Now Offers No. 7 Luxor Goggles to the Commercial Aviation Trade

NO. 7 LUXOR Goggles, E. B. Meyrowitz, Inc., manufacturer, announces, are now being offered to the commercial aviation industry. This goggle, the U. S. Air Service Model, was manufactured last year under exclusive contract with the Government.

The model has two major patented features. The bridge contains the new clutch type adjustment whereby the lenses may be fitted to the spread of the eyes, and special assymetrical sponge rubber cushions enable the pilot to fit the goggle comfortably to the face, it is said, with positive protection against air seepage.

Coolidge Recommends New Appropriation For West Indies Air Mail Transportation

PRESIDENT COOLIDGE has recommended to Congress a supplemental appropriation of $1,750,000 for carrying foreign mails by air route from San Juan, Porto Rico, to Santiago, Cuba by way of Santo Domingo and Port-au-Prince. The letter of the Director Lord of the Budget Bureau approving of the appropriation said the Bureau believed that all regular first class mail from the United States to the countries reached by the new routes will shortly be carried by air. This undertaking calls for an extended plan of air mail transportation.

Milwaukee Light Plane Club Sponsoring Small Plane Meet to be Held in August

PLANS ARE now being made by the Milwaukee Light Plane Club for the first national "baby" plane aviation contest to be held in Milwaukee. The event will take place at the Cudahy Airport the last week in August, it has been announced.

An "On to Milwaukee" race, which is to bring aircraft from all parts of the country, is planned as one of the features of the meet. The 50 members of the club are now hard at work on six planes now under construction in Milwaukee to be entered in the competition. Arthur Pauker is president of the group and Hugo Meissner is vice president.

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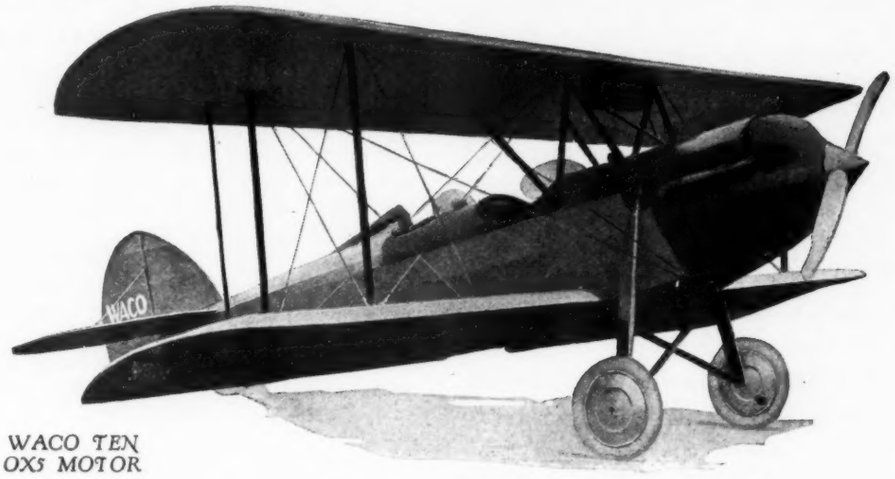

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WACO AIRPLANES

The Advance Aircraft Co. TROY OHIO

Aeronautic Division of Engineering Society To Hold Conference in Detroit June 28-29

ON JUNE 28-29 a national aeronautic meeting will be held in Detroit by the Aeronautic Division of the American Society of Mechanical Engineers. The conference will be under the auspices of the organization's Detroit section, which has arranged the meeting to coordinate with the Gordon Bennett International Balloon Race, the 1928 National Air Tour, and the Boys Airplane Model League Convention and Tournament —all to be held at that time in Detroit.

The preliminary program of the engineers calls for technical sessions on: transportation, wood in aircraft, design, airway developments, power plant, and international developments and military aviation. Excursion tours to plants are being arranged for the afternoon of June 29, while a banquet is planned for Thursday evening June 28 at which the internationally known participants of the above contests will be present. Saturday is being given over to the contests to take place at Ford Airport.

The entire program is open to the public, and the technical meetings and banquet will be held at the Book-Cadillac Hotel.

Two Air Lines to Offer Amphibian Service Between Los Angeles and Catalina Island

TWO AIR lines will be operating amphibian planes between downtown Los Angeles and Catalina Island this summer, according to recent announcements. Pacific Marine Airways, which has for seven years operated a flying boat service between Los Angeles Harbor and the Island, now announces the purchase of two Sikorsky Amphibians. These, it is understood, will be put in service June 1 to be flown direct from Roger's Airport, the Harbor will no longer be needed with the amphibian type plane.

In addition to this service, Western Air Express will offer daily service, according to the recent statement of Harris M. Hanshue, president and general manager. It is said that two amphibians have already been ordered for this service, which is scheduled to start July 1. These planes will be flown from Vail Field to Avalon Bay, Catalina Island, the time of flight over either route being set at about 25 min. for the distance of 40 mi. The make of equipment to be used by Western Air Express has not yet been announced.

More Machinery Installed in Kinner Plant To Meet the Growing Demand for Engines

MORE THAN $10,000 worth of machinery has been installed in the Kinner engine factory at Glendale, Calif., within the past weeks in an effort to meet the growing demand for the Kinner 100 hp. radial engine. Production is now approaching 600 engines per year and a greatly increased production schedule is in prospect, according to Mr. Kinner.

It is said that 21 Kinner engines have been sold as a direct result of the recent Detroit aircraft show. In addition to this, recent orders were received for 10 engines from the Simplex Aircraft Corp., Defiance, O.,; and for 50 engines to the West Coast Auto Body works of Los Angeles. The latter organization, it is understood, is to commence building light biplanes.

Ten Colleges Enter Intercollegiate Races Scheduled for June 30 at Mitchel Field

ENTRIES OF 10 colleges have been received for the intercollegiate airplane races to be held at Mitchel Field, L. I., N. Y., on June 30. The Loening Aeronautical Engineering Corp. of New York and the National Aeronautic Association are sponsoring the competition, and Grover C. Loening, president of the Loening company, has donated cash prizes to be awarded the winners of the events.

The colleges which have entered thus far are Harvard, Yale, Massachusetts Institute of Technology, Pennsylvania, Minnesota, Michigan, Georgia Tech., New York University, Richmond, and Brown.

Von Hoffmann Flying School Lets Students Fly home for Last Few Instruction Hours

SINCE IT has always been the ambition of the flying student to return to his home town via the air and "give the folks a thrill", a new training idea has been evolved by the Von Hoffmann Aircraft School of St. Louis. The school now allows some of its students who live near St. Louis to take their last few hours of cross-country flying instruction in a hop to their home town.

On each occasion, the flying student pilots the plane home, flies over the town several times, and after landing turns the plane over to his instructor to take back to St. Louis. He himself is then ready for the praise and applause befitting the homecoming of an initiated aviator—unless he has made some variation of a Chinese landing necessitating the return of the instructor to St. Louis by train.

German Air Law Expert to Give Addresses In America on Legal Aspects of Aviation

A SERIES of addresses are to be delivered in the United States this summer on the legal aspects of aviation by Prof. Otto Schreiber of the Air Law Institute in Koenigsberg University, Germany. Professor Schreiber is regarded as an authority on legal angles of aviation.

A special study of the laws governing aeronautics has been made at Koenigsberg by the faculty which began work on the subject in 1924 under the direction of Professor Schreiber. Some 400 volumes on legal aviation are to be found in the Institute's library. More than 2,000 air laws are now in force in various parts of the world, according to Professor Schreiber, who plans to codify these laws.

Daily Richmond, Norfolk, Washington, and New York Air Service Will Begin June 1

RICHMOND, VA., Norfolk, Va., Washington, and New York are to have a daily air service, to begin about June 1, according to announcement by Thomas G. Abbott, managing director of the National Airways, Inc.

It is understood this corporation means to operate on a regular schedule of a plane a day each way between all cities on the route, seaplanes being used between Norfolk and Washington and land planes on other routes. Week end trips to Virginia Beach, it was also stated, are being planned.

John A. Hambleton is Appointed Director Of United States Aeronautical University

JOHN A. HAMBLETON, Baltimore, Md., aviator and banker, has been appointed a director of the United States Aeronautical University, according to an announcement of the United States Airport Association. Plans are under way by which the University is to obtain an endowment of $10,000,000. The interest on this sum would be used to establish an aeronautical school where flying will be taught and research work undertaken.

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Last Minute Briefs

Oil City, Penna., formally dedicated its municipal airport Saturday May 5. The day was made a city holiday. A banquet was held in the evening.

The International Aircraft Corp., Ancor, O., will shortly complete 25 of its model F-17 "International Sportsman" biplanes. Ninety-six of these planes are on order.

Entire state dealership for the Eaglerock plane is now held by the Dakota Air Service, Inc., of Ryder, N. D. Waco dealership for the western half of North Dakota is also held by the company.

Alvin S. Robbins, Jr., 16 yr. old pilot, will shortly leave Atlantic City, N. J., in an Eaglerock plane to tour the United States over a period of nine or 10 months. He will represent the La France Mfg. Co. of Philadelphia, soap manufacturer.

Travis G. Boggs has joined the Akron Airport Co., Inc., Akron, O., where he will do passenger and student work. Mr. Boggs was formerly associated with the Midwest Air Transport Co. of Madison, Wis. He is a Kelly Field graduate.

Colonial Airways, Inc., has leased two acres of land from the City Commission of Newark, N. J., at the Port of Newark Airport, which is expected to be finished by August. The Colonial company plans to erect hangars on the site leased.

As AVIATION goes to press, Prof. Hugo Junkers, designer and builder of the planes which bear his name, is en route from Germany to America. Whether his journey is a business or pleasure trip is not definitely known at this time.

May 21, the day Lindbergh landed at Le Bourget Airdrome, Paris, on his trans-Atlantic flight last year, will be "Aviation Day" in St. Louis. A celebration is being arranged by the St. Louis Air Board.

Construction work has started on the new plant of the Advance Aircraft Co. of Troy, O., which is expected to be completed by July. The plant site is on the recently acquired 100 acre flying field on the outskirts of the city.

The Loening Aeronautical Corp. of New York City is now completing a government order for 16 OL-8 amphibian planes to be used in Nicaragua. Four of the planes have already been sent to Central America.

Air transportation by the American Railway Express Co. is now available to additional West Coast cities under a recent contract between that company and the Pacific Air Transport Co.

That the services of Lieut. Robert G. Minick of the Reserve Corps, 429th Pursuit Squadron, have been secured as chief instructor of flying is announced by the Atkinson Aviation Co. of Gary, Ind.

The St. Joseph Valley Aviation Club of South Bend, Ind., will hold an air meet Saturday and Sunday May 19-20 at its airport six and one-half miles northeast of the city. The club is now printing a year book covering the club's activities. A copy is to be mailed to every airport in the country.

The Chicago Association of Commerce is now distributing its booklet entitled "Chicago, the Aeronautical Center." The publication includes a survey of aeronautical activities in the metropolitan district during 1927 as well as maps with data concerning the Chicago airports.

Tests are being made at the General Electric Co. laboratory at Cleveland, O., on a 50 kilowatt light bulb for airport use. The new bulb, three feet high and 12 in. in diameter, is said to be the most powerful built, 30 kilowatt balbs being the largest incandescent lights made heretofore.

A 31 page illustrated booklet has been issued by the Stout Metal Airplane Co., Division of the Ford Motor Co., describing the Ford-Stout planes and the activities of the company. Information on how to organize an air line, and other general information, is also given in the book.

Berry Brothers, Inc., manufacturer of aircraft finishes, announces that Herbert H. Longaker, late of the company's Philadelphia branch, has been appointed Eastern aeronautical representative to have direct charge of all aviation division sales in the New York and Philadelphia branch territories.

The Omaha-Winnipeg Airway Association for the promotion of an air route between these two cities has been formed in Omaha, Neb. Lack of railway facilities between Omaha and Winnipeg was cited as an indication the venture would be profitable.

Arrangements have been completed for the construction of an aerial beacon on Roanoke Tower, La Salle and Madison streets, Chicago. The beacon will be erected and maintained by the Greenebaum Sons Investment Co. It will stand 520 ft. above the sidewalk.

That F. R. Ewer has accepted a position in the Berry Brothers, Inc., aircraft division as practical demonstrator is also announced. Mr. Ewer was formerly connected with the Travel Air Mfg. Co., the Stinson Aircraft Corp., and the Cessna Aircraft Co.

A. H. Kreider, president of the Kreider-Reisner Aircraft Co., Inc., of Hagerstown, Md., manufacturer of Challenger planes, states that his company plans an increase in manufacturing facilities. A new landing field was recently purchased on which to test new planes.

In his career as a pilot, Col. Charles A. Lindbergh has flown more than 200,000 mi. it was estimated when he recently renewed his Transport License No. 69. Colonel Lindbergh reported his hours in the air as 2,520 and his number of flights as 7,800.

Five Stinson-Detroiter and two Travel Air planes totalling a cost of $60,000 have been sold in one week by the Thompson Aeronautical Corp. of Cleveland, O. R. C. Marshall, chief pilot and general manager of the company, was given principal credit for the sales, which came at the time of the Detroit show.

Cedric McIntyre, representative of the N. Erlanger-Blumgart Co. of New York City, is using airplanes to cover his territory both for the purpose of saving time and for the increased attention thus received from his accounts. The Inland Eaglerock Aircraft Co. of Spokane, Wash., extended McIntyre its services throughout Eastern Washington and Northern Idaho.

A Message to
AIRCRAFT MANUFACTURERS

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Picture these great natural and acquired advantages — and you'll begin to understand what San Diego — and Lindbergh Field — offers to the aircraft industry.

Lindbergh Field, costing $650,000 and designed to be one of the finest airports in the world, will be illuminated at night, will accommodate land and seaplanes, provide space for factories, shops, hangars, etc. It is only 1 1-2 miles from the business center of the city, adjoining main highways, street car lines, railroads and steamship terminals. Special low rates for factory sites on this field are now being offered to legitimate aircraft industries. *Inquiries solicited.* Write to Industrial Department, 794 Chamber of Commerce Bldg., San Diego, Calif.

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MANUFACTURERS' SPECIFICATIONS ON ENGINES AVAILABLE FOR COMMERCIAL USE AS COMPILED BY AVIATION

THE TABLE BELOW IS BELIEVED TO BE ACCURATE BUT *AVIATION* DOES NOT ASSUME RESPONSIBILITY FOR THE FIGURES GIVEN

This table will appear monthly and corrections and suggestions are invited

MANUFACTURER OR AGENT	Engine	Cooling System	Cylinder Arrangement	No. of Cylinders	No. of Cycles	Propeller Drive	Rated Hp. and R.P.M. at Sea Level	Maximum Hp. and R.P.M. at Sea Level	Weight Dry Without Hub or Starter	Weight Per Rated Hp.	Bore and Stroke (In.)	Compression Ratio	B.M.E.P.	Displacement (Cu. In.)	Frontal Area (Sq. Ft.)	Diameter of Mounting Ring or Distance Between Bearers (In.)	Height or Overall Diameter (In.)	Length Without Starter (In.)	Guaranteed Fuel Consumption at Rated Hp. Lb./Hp./Hr.	Oil Consumption Lp./Hp./Hr.	Valve Mechanism	Cylinder Construction (See Key)	No. Intake Valves Per Cylinder	No. Exhaust Valves Per Cylinder	Make Spark Plugs Supplied With Engine	Type of Ignition	Make Ignition	No. Carburetors	Make Carburetors	Make Starter	Are Exhaust Manifolds Provided	Shipping Weight Crated	Dept. of Commerce License	Cost at Factory
Aircraft Engine Co.	Comet	A...	Rad.	7	4	D...	150–1800				4½x5½										prr.	Al, S.	1	1		2M.	Se.		Sy,E	Be.			N.	
Allison Engineering Co.	V1410	A...	IV-45°.	12	4	D...	410–1800	430–1900	1000	2.44	4½x7	5.3	128	1410		17..	46¾	78½	.55	.03	ohc.	Al, S.	1	1	BG	2B.	De.	1	Sg¹	E.			Y	
Allison Engineering Co.	VG1410	A...	IV-45°.	12	4	G¹.	410–1800	430–1900	1125	2.62	4½x7	5.3	128	1410		17..		85½	.55	.03	ohc.	Al, S.	1	1	BG	2B.	De.	1	Sg¹	E.			Y	
Allison Engineering Co.	V1650	W..	IV-45°.	12	4	D...	420–1700	450–1800	885	2.10	5 x7	5.4	122	1650		17..	46⅞	74¼	.53	.025	ohc.	Al, S.	1	1	BG	2B.	De.	1	Sg¹	E.			Y	
Brownback Motor Laboratories, Inc.*	Anzani 3-35	A...	Rad.	3	4	D...	35–1700	45–1800	115	3.29	3¹⁵⁄₁₆x4²³⁄₃₂	5.1		119		9.5	24¹³⁄₁₆	21 ¹³⁄₃₂	.53	.025	prr.	S.	1	1		2M.	AS.		Z.		Y		Y	$731.50
Brownback Motor Laboratories, Inc.*	Anzani 6-80	A...	Rad.	6	4	D...	80–1500	89–1600	215	2.69	4⅛x4⅜	5.1		397		10.6	35¹³⁄₁₆	29	.53	.027	prr.	S.	1	1		2M.	AS.		Z.		Y		Y	1650.00
Brownback Motor Laboratories, Inc.*	Anzani 10-120	A...	Rad.	10	4	D...	120–1500	131–1600	320	2.67	4⅛x5½	5.5		736		11.0	43⅝	34¹¹⁄₃₂	.60	.031	prr.	S.	1	1		2M.	AS.		Z.		Y		Y	2167.50
Curtiss Aeroplane & Motor Co.	OX-5	W..	V-90°.	8	4	D...	90–1400		375	4.17	4x5	4.9		502		12⅞			.55	.030	prr.	Mo, C.	1	1		1M.			Z.		N.		Y	
Curtiss Aeroplane & Motor Co.	OXX6	W..	V-90°.	8	4	D...	110–1900		390	3.55	4¼x5	4.9		568		12⅞			.55	.030		Mo, C.	1	1		2M.			Z.		N.		Y	
Curtiss Aeroplane & Motor Co.	C-6A	W..	L.	6	4	D...	160–1700	165–1750	420	2.62	4½x6	5.2	133	573		15¾		57¹³⁄₁₆	.52	.015	ohc.	Al, Al, S.	2	2	AC	2M.	Sp.	1	Z.	U.	N.	865	Y	
Curtiss Aeroplane & Motor Co.	D12	W..	V-60°	12	4	D...	435–2300	445–2300	680	1.47	4½x6	5.3	135	1145		15¾		56¾	.52	.015	ohc.	Al, Al, S.	2	2	BG	2M.	Sc.	2	Sg.	E.	N.	1080	Y	
Curtiss Aeroplane & Motor Co.	Conquerer V-1570	W..	V-60°	12	4	D...	600–2400	615–2400	760	1.26	5½x6¼	5.8	130	1569		15¾		56¾	.52	.015	ohc.	Al, Al, S.	2	2	BG.	1M.	Sp.	2	Sg.	E.	N.	1040	Y	
Curtiss Aeroplane & Motor Co. Inc.	Conquerer GV-1570	W..	V-60°	12	4	G².	600–2400	615–2400	840	1.40	5½x6¼	5.8	128	1569		15¾		56½	.52	.015	ohc.	Al, Al, S.	2	2	BG.	1M.	Sp.	2	Sg.	E.	N.	1120	Y	
Dayton Airplane Engine Co.	Bear	A...	L.	4	4	D...	110–1550	125–1800	375	3.41	4½x7	5.3	118	444		16	38½	47⅝	.505	.0175	ohc.	Al, NI.	1	1		2M.	Sp.	1	F.	N.	N.	550		$1600
Fairchild Caminez Engine Corp.	Caminez 447-C	A...	Rad.	4	4	D...	135–1000	140–1050	350	2.50	5½x4½	5.0	120	447	3.9	21½	36	35	.55	.035	prr.	Al, S.	1	1	AC.	2M.	Sc.	1	Sg¹.	E.	X.	775	1	
Hallett Mfg. Co.	H-526	A...	Rad.	7	4	D...	130–1800		425	3.26	4¾x5	5.2		526		18½	46	37			prr.	C.	1	1	BG.	2M.	Sp.	2	Z.		N.		N	
Irwin Aircraft Co.	Meteormotor I79	A...	Rad.	4	2	D...	20–1730	25–2200	65	3.25	2⅞x2¾	5.0	110	79	2.0	8⅞	23	16	.45	.031	N,.	Aa, Aa, S.	1	1	RB.	1M.	RB.	1	Wf.		N.	100	N	$625
Kinner Airplane & Motor Corp.	K-5	A...	Rad.	5	4	D...	100–1800		231	2.30	4.25x5.25	5.0		372		14					prr.	Al, Al, S.	1	1		2M.	Sc.	1	Wf.				3	$1875
Frank L. Odenbret, Inc.	Floco A-7-R	A...	Rad.	7	4	D...	150–1800		430	2.87	4½x5½			612			45½	35								M.	Sc.	1	Sg.			750	N	
O.E.Szekely Corp.	SR-3	A...	Rad.	3	4	D...	40–1800	45.6–1900	144	3.8	4½x4¾	4.8	100	191	2.3	9⅞		23¾	.57		p	C.	1	1		2M	Sc.	1	Z.	N.	N.	205		
Packard Motor Car Co.	1A-2775	W..	X.60°.	24	4	D...	1200-2600	1300-2700	1500	1.15	5⅜x5	7	150	2775	6.22	14¼	45½	78⅛	.52	.03	ohc.	S.	2	2	BG	4B.	Sc.	4	Sg.	O.	N.		Y	25,000
Packard Motor Car Co.	3A-1500	W..	V-60°	12	4	D...	600–2500	650–2700	760	1.26	5⅜x5½	5.5	140	1498	4.03	15¾	38¹⁵⁄₁₆	62½	.52	.015	ohc.	S.	2	2	BG	2M.	Se.	2	Sg.	Ae.	N.	1275	Y	12,000
Packard Motor Car Co.	3A-1500	W..	V-60°	12	4	G.	600–2500	650–2700	880	1.46	5⅜x5½	5.5	140	1498	4.03	15¾	38¹⁵⁄₁₆	65	.52	.025	ohc.	S.	2	2	BG	2B.	De.	2	Sg.	Ae.	N.	1300	Y	17,375
Packard Motor Car Co.	3A-1500	W..	V-60°	12	4	D...	600–2500	650–2700	780	1.30	5⅜x5½	5.5	140	1498	4.03	16¼	38⅝	62½	.52	.025	ohc.	S.	2	2	BG	2M.	Se.	2	Sg.	Ae.	N.	1275	Y	12,000
Packard Motor Car Co.	3A-2500	W..	V1-60°	12	4	D...	800–2000	835–2100	1160	1.45	6¾x6½	5.7	135	2490	4.8	18¼	36⅛	69¾	.52	.015	ohc.	S.	2	2	BG	2M.	Sc.	2	Sg.	Ae.	N.	2150	Y	15,625
Packard Motor Car Co.	3A-2500	W..	V-60°	12	4	G...	800–2000	835–2100	1380	1.72	6¾x6½	5.7	135	2490	5.1	18¼	36⅛	76½	.52	.015	ohc.	S.	2	2	BG	2B.	De.	2	Sg.	Ae.	N.	2340	Y	19,375
Pratt & Whitney Aircraft Co.	Wasp	A...	Rad.	9	4	D...	400–1900		660	1.65	5⅜x5¾	5.0	124	1344		23⅜		43⅜	.55	.035	prr.	Al, S.	1	1	BG.	2M.	Sc.	1	Sg.		N.	1150	Y	
Pratt & Whitney Aircraft Co.	Hornet	A...	Rad.	9	4	D...	500–1900		750	1.5	6¼x6⅜	5.2	123.5	1690		23⅜		44⅝	.55	.035	prr.	Al, S.	1	1	BG.	2M.	Sc.	1	Sg.		N.	1325	Y	
Quick Motors Co.	Quick-Radial	A...	Rad.	9	4	D...	125-1450		325	2.6	4.13x5.51	5		667		19⅜	36	36			prr.	Al, S.	1	1	CH.	1M.	Sc.	1	Z.					$1750
Ryan Aeronautical Corp.*	Ryan-Siemens 5	A...	Rad.	5	4	D...	70–1750	75–1850	258	3.68	3.94x4.72	5.6	110.5	287		14..	40½	34	.50	.022	prr.	Al, S.	1	1	O.	2M.	O..	1	Sm.	RB.	Y.	630	Y	1,800
Ryan Aeronautical Corp.*	Ryan-Siemens 7	A...	Rad.	7	4	D...	96–1750	102–1850	328	3.40	3.94x4.72	5.6	108.0	402		14..	40½	32	.50	.022	prr.	Al, S.	1	1	O.	2M.	O..	2	Sm.	RB.	Y.	675	Y	2,340
Ryan Aeronautical Corp.*	Ryan-Siemens 9	A...	Rad.	9	4	D...	125–1750	132–1850	382	3.05	3.94x4.72	5.6	109.5	517		14.6	40½	32	.50	.022	prr.	Al, S.	1	1	O.	2M.	O..	2	Sm.	RB.	Y.	720	Y	2,970
Tips & Smith, Inc.†	Super-Rhone	A...	Rad.	9	4	D...	125-1450	133-1650	15	2.52	4½x5½	5.2		667	4.75	11..		39	.31	.036	prr.	-, S, C.	1	1	Sp.	1M.	Dx.	1	Z.			400	N	
Velie Motors Corp.	Velie M5	A...	Rad.	5	4	D...	70–1800	80–2000	210	2.63	4½x3¾	5.2		2506		12¾	32	27	.55	.025	prr.	Al,S.	1	1	AC.	2M.	Sc.	1	Z.	X.E	Y.			
Warner Aircraft Corp.	Scarab	A...	Rad.	7	4	D...	110–1850	120–1925	270	2.45	4¼x4¼	5.2	112	422		17	35½	27½	.50	.01	prr.	Al,S.	1	1	AC.	2M	Sc.	1	Sg.		N.		2	$2,245
Wright Aeronautical Corp.	Whirlwind J5	A...	Rad.	9	4	D...	200–1800	225–2000	500	2.50	4½x5½	5.2	123	788		19¼	45	33¾	.60	.025	prr.	Al, S.	1	1	AC.	2M.	Sc.		Sg.			100	Y	4,980
Wright Aeronautical Corp.	Cyclone R1750	A...	Rad	9	4	D.	525–1900		760	1.52	6x6⅞		130	1753		25¾	53⅝	40⅝	.55	.035	qrr.	Al,S.	1	1	BG.	2M.	Sc.	1	Sg.			1530	Y	

*—Engines of foreign manufacture
†—rebuilt
A—Air cooled
Aa—Aluminum alloy
Ae—Aeromarine
Al—Aluminum
AS—Anzani or Scintilla
B—Battery ignition
Be—Scintilla booster magneto
C—Cast iron
Ch—Champi on
Cylinder Construction
first—head
second—walls or water jack
third—sleeve, if any
D—Direct
De—Delco
Dx—Dixie
E—Eclipse
E—Ensign
G—Geared
G¹—5:3 epicyclic gear
G²—2:1 reduction gear
G.E.—General Electric
I—Inverted
L—Cylinders in line
Mo—Monel
M—Magneto
NI—Nickle Iron
N—No
O—Own
ohc—Overhead cam
P—applied for
prr—Push rods and rocker arms
Rad—Radial
RB—Robert Bosch
Sc—Scintilla
Sg—Stromberg
Sg¹—Stromberg NA-U5 duplex
Sg²—Stromberg NAS-SE
Sm—Sum
Sp—Splitdorf
S—Steel
U—U.S.L. Electric
V—Vee
W—Water cooled
Wf—Winfield
X—Extra
Y—Yes
Z—Zenith

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January and February Aircraft Exports Increase 225 Per Cent. Over Last Year

AIRCRAFT INDUSTRY exports for the first two months of this year were valued at $491,514, it is reported. According to the Statistical Division of the Department of Commerce, this figure represents a 225 per cent. increase of $151,135 over the same period in 1927.

Complete airplanes shipped to foreign countries during the two months numbered 37 compared with one in last year's period. These 37 were valued at $367,722, the one plane exported at the time last year being valued at $19,500.

Aircraft engines exported from the United States the first two months of this year almost doubled in number from eight to 14 but declined in value from $57,262 to $40,121—the unit value being lower. Aircraft parts, except tires, exported were valued at $83,671 compared with $74,373 for last year's period.

Peru was the outstanding purchaser of American aircraft products the first two months of 1928; it bought 18 of the entire 37 airplanes sold by the United States, which were valued at $120,950. In addition, Peru purchased $6,155 worth of aircraft parts.

Canada, second best market, bought five planes valued at $58,970, three engines valued at $5,300 and $27,488 worth of aircraft parts. Great Britain bought two planes valued at $20,000 and $24,116 worth of parts, but did not reach Mexico's total with four planes valued at $70,000 and $2,252 of additional parts.

Cuba bought four planes; they were valued at $54,887. The Philippines also bought two planes valued at $34,500. Netherlands, which did not buy any whole planes, bought five engines valued at $22,836 and parts valued at $3,141. Australia and French Oceania also each bought an airplane from the United States in January and February.

Maddux Company Begins Daily Ford Plane Service from San Diego to Los Angeles

DAILY PASSENGER plane service between San Diego, Los Angeles, and San Francisco was inaugurated recently when three of the multi-engined 12 passenger Ford monoplanes operated by Maddux Airlines, Inc., took off together from Roger's Airport for the opening flight of the service. The Mayors of Los Angeles and San Francisco officiated at the ceremonies and 30 passengers were in the party that made the first trip. The planes were piloted by Eddie Bellande, George Allen, Larry Fritz, and Frederick Whitney.

One plane will fly each way daily and the third will be held in reserve for sightseeing and charter service, Sunday and holiday traffic over the regular route, and for emergencies. The schedule contemplates a flying time of 5 hr. 45 min.

Stops will be made as follows:

Northbound: Leave San Diego at 8:00 A.M.; arrive Los Angeles, 9:15; arrive Bakersfield, 10:50; arrive Fresno, 12 Noon; arrive San Jose, 1:25 P.M.; and Oakland municipal Airport at 1:45 P.M.

Southbound: Leave Oakland, 9:30 A.M.; arrive San Jose, 9:50; arrive Fresno 11:10; arrive Bakersfield 12:20 P.M.; arrive Los Angeles, 1:45 P.M., holding over until 4:30 P.M. for departure to San Diego, arriving there at 5:45 P.M.

New Downtown Boston Store is Opened For Sales of Rides, Flying Courses, etc.

BOSTON NOW has a downtown store devoted to the sale of airplane rides, flying courses, pictures, books, and miscellaneous products of aviation. The Boston Airport Corp. has taken a year's lease on a large office adjoining the lobby of the new Hotel Statler, and William Eaton, field manager of the Nantucket Airport last summer, is in charge of it. The formal opening occurred late in April, but carpenters continued work on interior decoration until May.

The project was originally suggested as a joint endeavor by President John D. Haughey of Air Service of New England, Inc., who took the option on the store in February, Harold Dennison of the Dennison Aircraft Corp., who operates an airport at Atlantic, and Raymond Baldwin, head of the Boston Airport Corp. It was decided that the B.A.C. would undertake the project alone but cooperate in sales with the other firms.

The present store is the second down-town office for aviation, Air Service being at 38 Chauncy Street, 12th floor. It is the first street floor level aviation office to be established down town although Colonial Air Transport, Inc., maintained a sales office for its New York flights last spring in the Hotel Brunswick lobby through the Royal Blue Line, Inc.

Volume of Orders for the Floco Engines Brings New Capitalization and Expansion

FOLLOWING THE recent announcement of Floco aviation engine manufacture such a flood of orders for this product has been received that an immediate expansion has been effected. The Frank L. Odenbreit Co. of Los Angeles has been absorbed by the Floco Manufacturing Co. which is capitalized for $1,000,000 under the laws of the State of Nevada.

Acquisition of a new factory building has been undertaken and installation of modern machinery is in progress in order to arrange for an adequate production. Although it was originally planned to produce Floco aviation engines at the rate of 50 per month by August, it is thought that the new factory and machinery will soon double that production.

Frank L. Odenbreit remains as president and general manager of the Floco Manufacturing Co., with Thomas M. Hardesty holding the position of director of sales.

National Lumber Manufacturers' Group Issues Booklet on Hangar Construction

DEMAND FOR detailed information of the establishment of airports has led the National Lumber Manufacturers Association to issue a booklet entitled "Airplane Hangar Construction." The publication was prepared by the engineering department of that association and aims to give advice and direction in the construction of hangars at costs which will not unduly handicap the development of air fields.

Structural and service requirements for hangars are summarized in the booklet, and complete working drawings, bills of materials, and estimated costs are given for four types of hangars, ranging from the single plane size to the large municipal airport hangar. Copies of the publication are available upon application to the National Lumber Manufacturers Association, Transportation Building, Washington, D. C.

The Velie M5 Aircraft Engine

Continued from page 1300

on the crank and is carried completely through it. A bolt passes through the hollow crank pin and crank cheeks to hold the two parts of the crankshaft together, while the two telescoping crank pin parts are located by means of a key. The crankshaft is supported in the rear by another SRB ball bearing.

The crankcase is a single piece with an integral four bolt mounting ring 12¾ in. in diameter. The nose or front section is bolted in place and carries the bearing which transmits the thrust of the propeller to the engine mounting by

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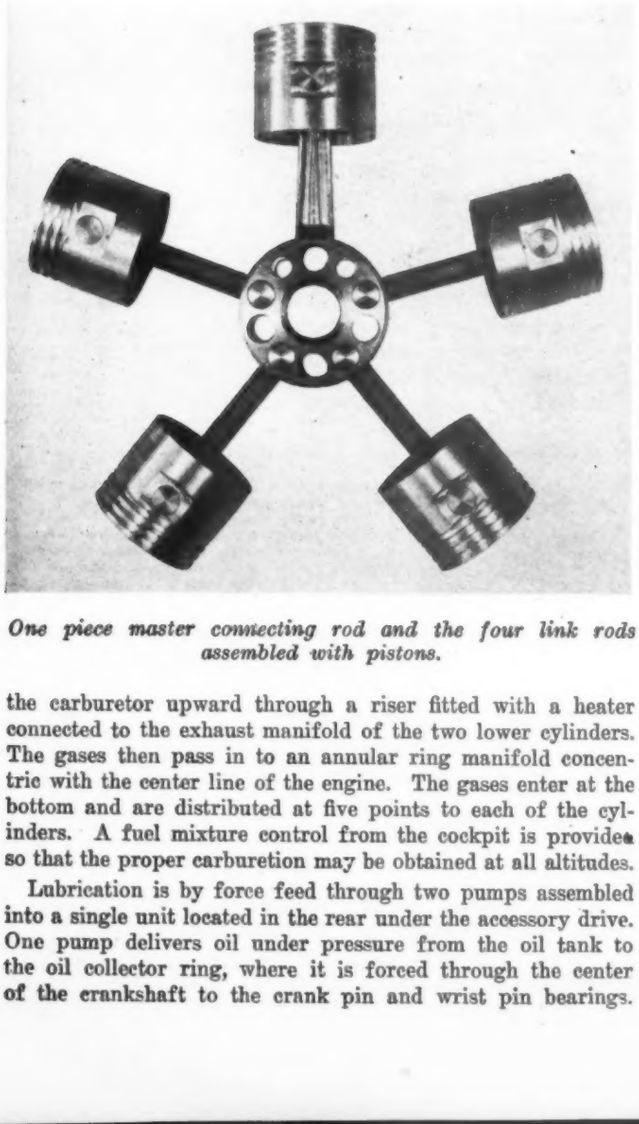
way of the crankcase. In the rear is the gear case carrying the magneto, oil pump and tachometer drive.

The rear of the crankcase also houses the single cam ring which actuates both intake and exhaust valves. The cam, which is driven by spiral gears, is in contact with the roller type valve lifters, operating in bronze guides. These lifters actuate the push rods which are connected at their upper ends to the rocker arms working on bronze bushings. Each rocker arm is mounted on a fitting on the cylinder head supporting the manifold on that side. Under the forward end of the rocker arm are flat helical springs with lightening holes in the spring holder. The valves themselves are of silichrome steel, with both intake and exhaust valves of the same dimensions, namely 1 11/16 in. diameter with 11/32 in. stems. The stems operate in cast iron guides lubricated with graphite.

As has been mentioned above, each cylinder is provided with two AC spark plugs. Ignition is provided by two Scintilla magnetos driven by spiral gears, thus providing two independent sources of ignition. The ignition cables are carried in a tube behind the cylinders supported at intervals on the crank case. The cables leave this tube and go to their respective spark plugs unsupported and unprotected. The manufacturer claims that many ignition troubles are avoided in this way. The engine is designed to take the standard mounting of the Eclipse electric starter, which when completely installed with battery weighs only 40 lb. This installation is optional and not provided as standard equipment.

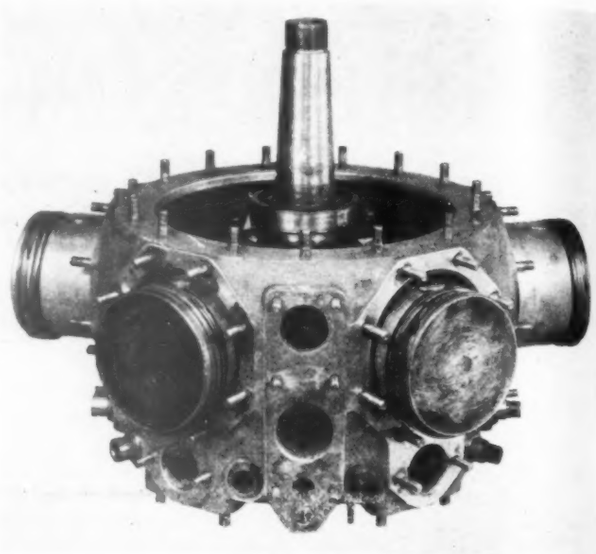
Below the engine and mounted between the two lower cylinders is a Zenith carburetor with the mixture passing from



One piece master connecting rod and the four link rods assembled with pistons.

the carburetor upward through a riser fitted with a heater connected to the exhaust manifold of the two lower cylinders. The gases then pass in to an annular ring manifold concentric with the center line of the engine. The gases enter at the bottom and are distributed at five points to each of the cylinders. A fuel mixture control from the cockpit is provided so that the proper carburetion may be obtained at all altitudes.

Lubrication is by force feed through two pumps assembled into a single unit located in the rear under the accessory drive. One pump delivers oil under pressure from the oil tank to the oil collector ring, where it is forced through the center of the crankshaft to the crank pin and wrist pin bearings. The excess oil drains into a sump on the bottom of the crankcase. This sump is fitted with cooling fins which maintain an oil temperature not over 150 deg. The other pump, or scavenger pump, returns the oil to the oil supply tank, from where the cycle is repeated. Both of these pumps are identical, being of the gear type. The oil pressure can be reg-



Crankcase and piston assembly of the Velie M5.

ulated through an accessible adjustment in the pressure pump. There are only two oil lines, one an inlet or suction line and the other the outlet or scavenger line.

The general specifications of the Velie M5, as supplied by the manufacturer, are as follows:

Number of cylinders	5
Cylinder arrangement	static radial
Cooling	air
Bore and stroke	4⅛ in. by 3¾ in.
Displacement	250.6 cu. in.
Compression ratio	5.2
Diameter of mounting ring	12¾ in.
Overall diameter	32 in.
Length, without starter	27 in.
Rated hp. at sea level	70 hp.
Rated speed	1800 r.p.m.
Maximum hp.	80 hp.
Maximum speed	2000 r.p.m.
Guaranteed fuel consumption at rated speed	.55 lb./hp./hr.
Guaranteed oil consumption at rated speed	.025 lb./hp./hr.
Weight dry, without starter and hub	210 lb.
Weight per rated hp.	2.63 lb./hp.

These figures have been included in the table of specifications on aircraft engines which appears monthly in AVIATION.

Design of Wing Beams

Continued from page 1299

Equation (5) is the one in which we are particularly interested.

Notes on the Precise Formulas.

The formulas derived above apply only to a single span. When a beam is continuous over two or more spans, the value of M_2 varies due to the compressive end load and this must be taken into account. To determine the amount of

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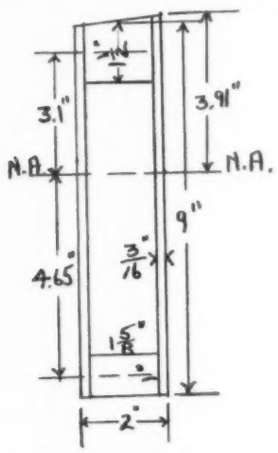
variation in M_2 is rather difficult. It requires the application of a Precise three-moment equation. A complete article will be written later on explaining how to handle the many variations in wing design, by the Precise Method.

It is well to bear in mind in setting up Equation 1 above that all moments which impose a compressive stress on the upper fibers of a beam are considered positive; when the upper fiber is in tension the moment is negative.

In the usual type of semi-cantilever monoplane the inner end of the beam is pinned horizontally and M_2 is zero. M_1 is the moment at the strut point due to the overhang.

Values of L/j and X/j work out more conveniently if kept in radians. If a table of trigonometric functions of angles



Front Spar - In Bay

Fig. 62.

in radians is not available, the angles may be converted from degrees by the simple relation that angle in radians = angle in degrees/57.3.

The Precise Method may also be applied to beams in which tension and bending are present. In this case the sines and cosines are replaced by the hyperbolic functions which are very difficult to handle and complicate the entire problem. Fortunately a tensile axial load in a beam reduces the bending stress as was shown in Chapter 2. If, then, we neglect the decrease in bending stress due to the tensile load and deal only with the bending stress before the addition of this tensile load we will be on the safe side. The stress at any section of a beam under these loads is then $My/I + P/A$, where M is the moment due to bending load alone and P is the tensile axial load.

Analysis of Wing Beams—Precise Method.

In applying the precise equations to determine the maximum moment in the span, M_{1-2}, the average axial drag load in the bays between the strut point and the fuselage is used. However, later, in designing the cross-section of the spar the true axial load at that cross-section will be used.

Axial Loads on Spars

Flight Condition	Spar	Average due to Drag	Due to Lift	Total
H.I.	Front	—887.75	—8260	—9147.75
	Rear	+697.5	—3894	—3196.5
L.I.	Front			
	Rear			
I.F.	Front			
	Rear			
N.D.	Front			
	Rear			

Preliminary Design of Spars.

Before the precise equations can be solved, it is necessary to know the value of I, the moment of Inertia, of the cross-section of the spar. A spar section must be drawn up which will fit in the wing at its proper location, and have a sufficiently large value of I. The size of a spar for any particular plane is best estimated from previous experience; otherwise a guess must be made and the precise equation solved, after which the spar must be redesigned if the stress obtained is too great. It should be borne in mind that no spar may be more than 5 times as high as it is wide. This is to prevent lateral failure under torsional loads. In Figs. 62 and 63 are illustrated box spar sections which experience indicates will be satisfactory for our plane.

Spar Properties.

Front Spar. (Fig. 62)

In Bay: Position of Neutral Axis:

$1\frac{5}{8} \times 1\frac{1}{2} \times X = 1\frac{5}{8} \times 1 \times (7.75 - X)$

$X = 3.10$ in.

$7.75 - X = 4.65$ in.

Moment of Inertia:

$$I(\text{flanges}) = \frac{1.625 \times (1.5)^3}{12} + 1.625 \times 1.5(3.1)^2 + \frac{1.625 \times 1^3}{12} + 1.625 \times 1^3 \times (4.65)^2 = .466 + 23.4 + .135 + 35.15 = 59.15 \text{ in.}^4$$

$I(\text{webs}) = 2(3/16 \times 9^3/12) + 2[3/16 \times 9(4.5 - 3.85)^2] = 22.8 + 1.43 = 24.23$ in.^{4}

$I(\text{total}) = 59.15 + 24.23 = 83.38$ in.^{4}

$y = 3.1 + .75 + .06 = 3.91$ in. and $y = 4.65 + .50 = 5.15$ in.

$y/I = 3.91/83.38 = .047$ when upper flange is compression flange (+ moment)

$y/I = 5.15/83.38 = .062$ when lower flange is compression flange (— moment)

$A = 1\frac{5}{8}(1\frac{1}{2} + 1) = 4.07$ sq. in. (webs are neglected)

Radius of Gyration: $\rho = \sqrt{I/A} = \sqrt{83.38/4.07} = 4.5$ in.

Slenderness Ratio: $L/\rho = 120/4.5 = 26.6$

Referring back to Fig. 34 of Chapter 4:

$\psi = 2 \times 3/16/2 = .187$ $\quad tc/h = 1\frac{1}{2}/9 = .166$

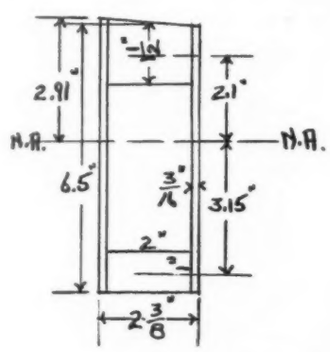
Allowable Mod. of Rupture = 6300 lb. per sq. in.

At Strut Point: (spar is solid)

$I = 2 \times 9^3/12 = 121.5$ in.^{4} $\quad y = 4.5 + .06 = 4.56$ in.

$y/I = 4.56/121.5 = .0375$ $\quad A = 9 \times 2 = 18$ sq. in.

30 in. Outboard of Strut Point: (Upper flange of spar



Rear Spar - In Bay

Fig. 63.

reduces to 1" depth at this point and remains constant out to the tip. Lower flange is 1" deep throughout.)

$I = 2 \times 9^3/12 - 1\frac{5}{8} \times 7^3/12 = 121.5 - 46.5 = 75$ in.

$y = 4.5 + .06 = 4.56$ in. $\quad y/I = 4.56/75 = .0607$

Rear Spar. (Fig. 63)

Position of Neutral Axis:

$2 \times 1\frac{1}{2} \times X = 2 \times 1(5.25 - X)$

$X = 2.1$ in.

$5.25 - X = 3.15$ in.

Moment of Inertia:

$I(\text{flanges}) = 2 \times (1.5)^3/12 + 2 \times 1.5(2.1)^2 + 2 \times 1^3/12 + 2 \times 1(3.15)^2 = .56 + 13.22 + .167 + 19.88 = 33.827$ in.^{4}

$I(\text{web}) = 2 \times 3/16(6.5)^3/12 + 2 \times 3/16 \times 6.5(3.25 - 2.85)^2 = 8.6 + .39 = 8.99$ in.^{4}

$I(\text{total}) = 33.827 + 8.99 = 42.817$ in.^{4}

$y = 2.1 + .75 + .06 = 2.91$ in.

$y/I = 2.91/42.817 = .068$

$A = 2 \times (1\frac{1}{2} + 1) = 5$ sq. in.

$\rho = \sqrt{I/A} = \sqrt{42.817/5} = 2.92$ in.

$\psi = 2 \times 3/16/2\frac{3}{8} = .158$

$t_c/h = 1\frac{1}{2}/6\frac{1}{2} = .23$

Allowable Mod. of Rupture = 6540 lb. per sq. in.

Listing of Data for Solution of Precise Equations.

The following table, when filled in, places at our disposal all the information required for solving the precise equation to find the maximum moment, M_{1-2}, in the span. It will be noted that L/j is listed in both radians and degrees for illustration purposes.

Table of Loads on Spars, Spar Properties, etc., for use in Precise Equations.

Spar	Flight Condition	Total Axial Load P	I	EI*	$j^2 = \frac{EI}{P}$	j	Span L	L/j in radians	57.3 L/j in degrees	Load per in. w	M
Front	H.I	-9187.75	33.35	165,400,000	11,560	105.9	120	1.101	63.1°	20.5	110,000
	L.I		33.35	165,400,000			120				
	I.F		33.35	165,400,000			120				
Rear	H.I	-3196.5					120			9.5	51,500
	L.I						120				
	I.F						120				
	N.D						120				

*E for spruce is 1,300,000.

When the chart is filled in, it will be quite obvious that the loads on the front spar are most severe in high incidence. That is, P and M_1 on the front spar will be much larger in the high incidence condition than in any other. On the rear spar either low incidence or nose dive will be the critical condition. If one is distinctly more severe than the other, only the worst condition need be investigated.

Determination of Maximum Moment in Span.

As the front spar is designed by the high incidence condition, the value obtained for M_{1-2} in the table below is the design value. A study of the loads on the rear spar from the table above when filled in will indicate which is the design condition for that spar. M_{1-2} on the rear spar may be found in a similar manner to that for the front spar. The table is self-explanatory when referred back to the derivation of the precise formulas.

Computation of Maximum Moments in the Span.

$M = D_1 \sec X/j + wj^2$	Front Spar H.I.	L.I.	Rear Spar I.F.	N.D.
Design Load — (w)	20.8			
$j^2 = EI/P$	11,860			
wj^2	246,500			
M_1	110,000			
$D_1 = M_1 - wj^2$	—136,500			
M_2	0			
$D_2 = M_2 - wj^2$	—246,500			
L/j in radians	1.101			
L/j in degrees	63.1°			
cosL/j	.453			
$D_1 \cos L/j$	—61,900			
$D_2 - D_1 \cos L/j$	—184,600			
sinL/j	.892			
$D_1 \sin L/j$	—121,900			
tanX/j =				
$D_2 - D_1 \cos L/j / D_1 \sin L/j$	1.515			
$\tan^2 X/j + 1$	3.30			
$\sec X/j = \sqrt{\tan^2 X/j + 1}$	1.816			
$D_1 \sec X/j$	—248,000			
$M_{1-2} = D_1 \sec X/j + wj^2$	—1,500			

This moment of —1500 inch pounds is very small. This

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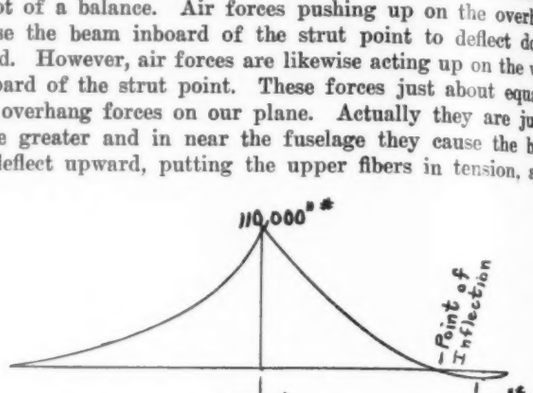
is due to the fact that our overhang is very large. To understand this effect we may consider our strut point to be the pivot of a balance. Air forces pushing up on the overhang cause the beam inboard of the strut point to deflect downward. However, air forces are likewise acting up on the wing inboard of the strut point. These forces just about equalize the overhang forces on our plane. Actually they are just a little greater and in near the fuselage they cause the beam to deflect upward, putting the upper fibers in tension, as is



Bending Moment Diagram
Front Spar - High Incidence

Fig. 64.

indicated by the fact that we have a negative moment. The moments on the front spar, high incidence, Case B, are shown graphically in Fig. 64.

The actual deflection of the front spar is illustrated in Fig. 65. The deflection is considerably enlarged for illustrative purposes.

Location of Maximum Moment in Span

From the table directly above:

$$\text{Tan}X/j = \frac{D_2 - D_1\cos L/j}{D_1\sin L/j} = 1.515$$

$X/j = 56.6$ degrees $= 56.6/57.3 = .988$ radians

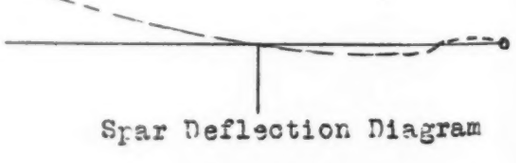
$j = 108.9$ from Table

$X = .988 \times 108.9 = 107.6$ inches in from strut point.

As the total distance from the strut to the fuselage is only 120 inches it is evident that this point is very near the fuselage as is shown in Fig. 64.

Point of Inflection.

The rules state that in the design of the spars, the loading of Case A (Fig. 56) must be employed for the overhang and inboard of the strut point as far as the outer point of in-



Spar Deflection Diagram

Fig. 65

flection. Both Case A and B have a point of inflection in the span. It is then necessary to find which is the outer point of inflection. The outer point of inflection of the two Cases will always be that due to the loading of Case B (Fig. 57). This is so because the overhang moment M_1, is less in this case and the loading inboard, which counteracts this moment, is heavier than in Case A, and will reduce the moment to zero sooner. The position of zero moment is of course the point of inflection.

To determine the point of inflection we make use of the formula which has already been used in Chapter 2. This formula does not take into account the effect of the axial load which shifts the point of inflection somewhat. This shifting

is so slight, however, that it may be neglected. The formula is:

$M_x = M_1 + S_{+1}X + wX^2/2$

By putting M_x equal to zero and solving for X we can find the point of inflection. Referring to the computations pertaining to Fig. 57 of Chapter 8 we have: $M_1 = 5293$ inch lb. $S_{+1} = -104.1$ lb.

Then $\varphi = 5293 - 104.1 \cdot X + 1 \cdot X^2/2$

Or rewritten: $X^2 = -208.2 \cdot X + 10{,}586 = 0$

To solve for X we may use the formula:

$$X = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

where a, b, and c are the coefficients of an equation of the form $aX^2 + bX + c = 0$. Our equation is now in this form and the values of the coefficients are $a = 1$, $b = -208.2$, $c = 10{,}586$.

$$\text{Therefore } X = \frac{208.2 \pm \sqrt{(-208.2)^2 - 4 \times 1 \times 10{,}586}}{2} =$$

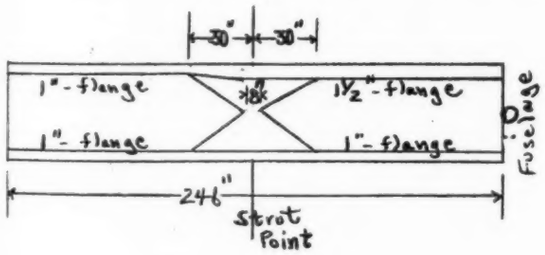
$$\frac{208.2 \pm 31.8}{2}$$

$x = 88.2$ and 120 inches in from strut point.

The value of $X = 120$ inches is of course at the fuselage where $M_x = 0$ due to the pin-joint. The value of $X = 88.2$ inches indicates that we are to design the spars from the tip to this point by the loading of Case A. This figure of 88.2 inches in from the strut point holds for both spars for all conditions.

Design of Wing Beams.

It is desirable in designing a wing beam to make it just strong enough to take the bending and compressive loads at each point along the span. The bending moment varies all along the span and it is necessary to find out its magnitude at various points before the final design can be made. It is usually advisable to keep a constant section spar for most



Design of Front Spar

Fig. 66.

of its length, but near the strut point where the moments are so enormous, this section must be strengthened. In the case of wooden box spars this is readily done by increasing the flange depths or inserting filler blocks.

The front spar of our plane will be as illustrated in Fig. 66. We will now figure the moments at the critical points i.e., where the spar section changes, and see if the sections at these points are strong enough.

Calculations of Moments.

The precise method has been employed to determine the maximum moment, M_{1-2}, in the span. As has been stated before this is very small and not at all critical. However, the outermost point of inflection is at 88.2 inches in from the outer strut point. Here the moment of Case B equals zero. From this point out the spar must be designed by Case A. The moments for Case A at the critical sections will be found and listed in the following table.

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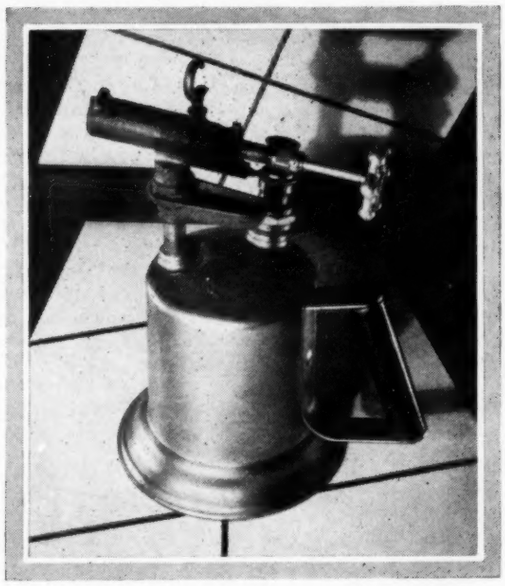

When you plank down your money for a blow-torch

YOU'D BE surprised what a lot of things there are inside of a blow-torch. When you buy one you have to take those insides pretty much for granted — the outside won't tell you a thing. Yet the insides of blow-torches differ considerably, making one work better and last longer than another.

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The formula employed is: $M_x = M_1 + S + iX + wX^2/2$

	M_1	S_1	X	S_1X	w	$\frac{X^2}{2}$	$\frac{wX^2}{2}$	$M_1+S_1X+\frac{wX^2}{2}$	Front Spar M.I. Net Beam Load	Front Spar M.I. Design M_x	Rear Spar M.I. Net Beam Load	Rear Spar M.I. Design M_x
$M_{30"out}$	—	—	—	—	1	—	—	4045*	15.45	74,600		
M_1	7145	-119.6	0	0	1	0	0	7145	15.45	132,000		
$M_{30"in}$	7145	-119.6	30	-3588	1	450	450	4010	15.45	74,100		
$M_{88.2in}$	7145	-119.6	88.2	-10560	1	3890	3890	478	15.45	8830		

* Moment of overhang from 30in. outboard of strut point to wing tip: (Fig 56) $M_{30"out} = .8 \times 54 (42+12) + \frac{.8^2 \times 54}{2} (28+12) + 1 \times 12 \times 6 = 4045$ in.lb.

It is to be noted that the moments as figured in the foregoing table neglected the effect of axial load in increasing the bending stress. The Precise Equations for calculating these moments could not be applied here unless we had previously solved the drag trusses for Case A as we did Case B. It will be recalled that the drag trusses were analyzed only for Case B, and the precise method applied to the wing beam for this case only. Case A however is in itself more severe for those portions of the spar it designs, and the secondary bending stress due to the compression load may be neglected.

Likewise in the table below the true axial load for Case A is unknown as the drag axial load for this case is unknown. We arbitrarily use the axial load of Case B as this is fairly close to what the true load of Case A would be. It is to be noted that the axial load listed below is not that due to the lift plus the average drag axial load but is the true axial load at the section. That is, to the lift axial load of 8260 pounds a load of 834 pounds is added to obtain the true axial load at the strut point and 30 inches inboard as these are in the first drag bay; a drag axial load of 940.5 pounds is added to obtain the true axial load at the sections 88.2 and 107.5 inches inboard as these are in the second drag bay.

The properties of the spar sections are obtained from the sections as originally designed in Fig. 62 and the attendant calculations. The slenderness ratio is figured on a length of span L of 120 inches. In this particular plane the maximum moment is so small and occurs so near the fuselage that it is easier and more conservative to take the entire length L. Ordinarily the nomogram of Fig. 37—Chapter 4 would be used to determine L. L/ρ is then obtained by division.

The Modulus of Rupture and the allowable stress F_t is found from Fig 34 of Chapter 4.

Computation of Stresses in Spars

Spar	Loading Condition	Moment	Magnitude of Moment	M/I	Bending Stress $f_b = \frac{Mc}{I}$	Axial Load P	Area A	Compression $f_a = \frac{P}{A}$	Required $f_t = f_b + f_a$
Front	H.I.	$M_{30"out}$	74,600	.0607	4540	—	—	—	4540
		M_1 out	132,000	.0375	4950	—	—	—	4950
		M_1 inb.	132,000	.0375	4950	-7074	15.-	505	5445
		$M_{30"}$ inb.	74,100	.047	3485	-7074	14.07	2230	5715
		$M_{88.2"}$ inb.	7,830	.047	415	-9200.5	14.07	2260	2675
		M_{1-2}	-1,500	.062	91	-9200.5	14.07	2260	2351
Rear	L.I.	$M_{30"out}$							
		M_1 out							
		M_1 inb.							
		$M_{30"}$ inb.							
		$M_{88.2"}$ inb							
		M_{1-2}							
	Dive		Last all quantities if Dive is more severe than L.I.						

Computation of Stresses in Spars (Cont.)

Spar	Loading Condition	Ψ ratio	f_a/f_t	Modulus of Rupture	L/ρ	f_b/f_t	f_t Allowable	f_b Required	M.S.
Front	H.I	.157	.111	6000	—	—	6000	4540	.32
		.157	1	9400	—	—	9400	4950	.90
		.157	1	9400	—	.906	9000	5455	.65
		.157	.166	6300	246	.61	5720	5715	.001
		.157	.166	6300	26.6	.155	4900	2675	.83
		.157	.111	6000	26.6	.04	4750	2351	1.02
Rear	L.I.								
	Dive								

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To be continued in the next issue of AVIATION

Airplane Spruce

Continued from page 1298

primarily for the production of spruce piano sounding-boards, later branching into other fields of specialized spruce manufacture. In 1911 the Posey firm started exporting airplane spruce to England, France and Germany, and during the World War accomplished noteworthy work in supplying aircraft spruce for the American government.

Recently the firm has provided the spruce for numerous distinguished planes including the Ryan monoplane "Spirit of St. Louis"; the Travel Air "Woolaroc", winner of the Dole race to Hawaii; the Travel Air winner of the 1926 Ford Reliability tour, and the Stinson "Pride of Detroit", round-the-world plane. The Posey company sells direct to more than 20 of the largest American producers in addition to supplying numerous wholesale spruce distributing houses.

Years of Experience Necessary

Manufacturing of airplane spruce is primarily a process of constant selection and elimination, coupled with careful seasoning, rather than of mere sawing of logs. The selective process starts with the choosing of the best trees, taken at certain altitudes where the finest fibers are found, and continues without interruption until the spruce is carefully packed in cartons for shipment. Only by many years of training is a man equipped to judge properly whether a piece of spruce is of the proper texture, of the correct density, and of sufficient strength for airplane construction. There is no substitute for this human factor in manufacturing spruce. To the uninitiated a stick of spruce for a wing spar might appear perfect; but to the experienced inspector, hidden defects might be evident which would spell disaster for the completed plane.

The Posey plant refuses to ship airplane spruce in "the raw," without final inspection, thus leaving the plane manufacturer to select his own timbers and cast aside those which he deems unfit. Every stick of airplane spruce the Posey plant ships out has been repeatedly inspected, and, to the best of the firm's knowledge and experience, is suitable for plane construction. T. B. Stinchfield, plant superintendent, a man of 26 years' lumber experience, and with the Posey company for the past 15 years, directs the activities of a corps of 12 assistants, each with 10 or more years' experience. The stamp "Stinchfield Inspection Final" on a carton is accepted by many of the purchasing concerns without question or further examination. Occasionally a concern will send a government inspector, and a staff man to examine the lumber, but most of them rely on the Posey 'O.K.'

Small Percentage of Log Acceptable

Because of the repeated inspections, the small percentage of the log found acceptable, the complicated air, loft and kiln drying, and the packing, the price of airplane spruce comes high. But when one visits the plant and observes the meticulous care taken in the process, the charges appear reasonable. Furthermore, by purchasing perfect lumber, the plane manufacturer keeps his factory wastage to a minimum and saves his freight on this wastage. A growing tendency among the consumers is to order the plane parts completely manufactured, ready for assembly. The Posey plant is equipped to turn out practically any piece of wing or fuselage spruce, correct in size to micrometer measurements. Some plane producers prefer to do their own machining, while others desire their timbers cut to approximate sizes.

Before a piece of spruce is boxed for shipment it must pass inspection on the following points:

It must be of the right texture, with specified number of grains to the inch.

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It must have the proper strength characteristics. To the unpracticed eye two pieces may be exactly alike, whereas the experienced inspector will detect grain flaws that necessitate throwing out the stick.

The stock must be of proper density. Pieces too heavy or too light are thrown out.

The grain must be straight and free from hidden defects.

Laboratory tests are made of specimen pieces for compression and tensile strength. All pieces are inspected on

Sitka airplane spruce packed in heavy cartons ready for shipment.

four sides and both ends. With these rigid requirements in mind, it may be understood why only 5 to 10 per cent. of the log is found satisfactory for planes.

The Posey company controls large stands of timber, but occasionally purchases selected logs from other concerns. Logs after inspection, are cut into the desired sizes and then put through the kilns, the latter a highly technical process demanding extraordinary skill and care. Airplane spruce is given the same painstaking kiln treatment accorded the finest piano sounding boards.

The spruce timbers are cut carefully from logs that have been 'blocked' to insure proper grain direction. Then comes the next inspection and the weeding process is well under way. After an air drying period in the yards, which varies from two to six weeks, the sticks are again inspected, and are taken to the loft kiln, heated with steam pipes, and to the steam kiln.

In the large ten carload capacity steam kiln, wet and dry heat brings the spruce to the proper moisture content. Dry heat is obtained by steam heated pipes, and damp heat provided by steam jets which spray the timbers at scores of points along the floor of the kiln. The timbers are stacked in a manner that permits the air and steam to circulate freely on all sides of the stock.

Damp heat is essential in the drying process since dry heat alone would crack the timbers. It is interesting to note that spruce may be dried to an 8 or 10 per cent. moisture content with a 40 per cent. humidity in the room. Temperatures will run at times as high as 145 deg. Fahrenheit.

Foxboro recorders register the heat and the humidity at three separate points in the kiln, this three-way check being an assurance that conditions are the same in all parts of the kiln. Humidity and heat are both regulated automatically.

Time required to bring the lumber to the proper moisture content varies with the size of the timbers. Government standards are closely adhered to, the time varying from six or seven days for an inch stick to about 24 days on a four inch piece. The time, however, is a variable factor and often takes longer.

Samples of the timbers, coated with rosin and lamp black to keep the samples from drying faster than the kiln load, are placed in the kiln and from time to time tested for tension, stress, and moisture content. These samples are weighed before and after retort drying to calculate the moisture content; and are examined by the kiln expert, Walter B. Slade, to determine if the timbers are 'muscle-bound', this condition being discernible through traces of warping. If such stress and tension is found, the kiln conditions are changed to in-

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sure perfect timbers. Stock is dried to the demands of the individual plane manufacturers, the moisture content varying from 8 to 15 per cent. The sticks are usually dried to the air moisture at the point of plane construction.

After kiln drying, the stock again must pass inspection; and indeed, the stock is never out of the hands of experts, all of whom watch constantly for imperfect pieces. Next comes the surfacing operation, another inspection, and finally the sanding and routing process. On the freight platform the stock undergoes a final inspection, or before it is packed into the cartons, if in small pieces. Because of the tedious inspections and the careful kiln drying process, a month or 45 days is the shortest possible time a spruce timber can be taken from the log to the freight car.

Sizes of the completed sticks vary from less than a quarter inch in thickness to the large wing beams which must bear the brunt of the stress and strain on a plane. Some prefer laminated spars, while others desire the solid, or routed, pieces.

In view of the rapidity with which large stands of timber are vanishing throughout the United States, it is quite probable that plane manufacturers have given thought to the likelihood of the spruce supply eventually being cut off. This would appear unlikely. In addition to the great Olympic Peninsula spruce stand, Oregon has untold millions of high grade board of high grade airplane spruce yet untouched. Many of the larger lumber companies in Oregon and Washington are now actively engaged in re-forestation work in cooperation with the Forest Service of the Department of Agriculture. Forest service officials predict that proper care in reforestation will insure ample timber in the Pacific Northwest for an indefinite period.

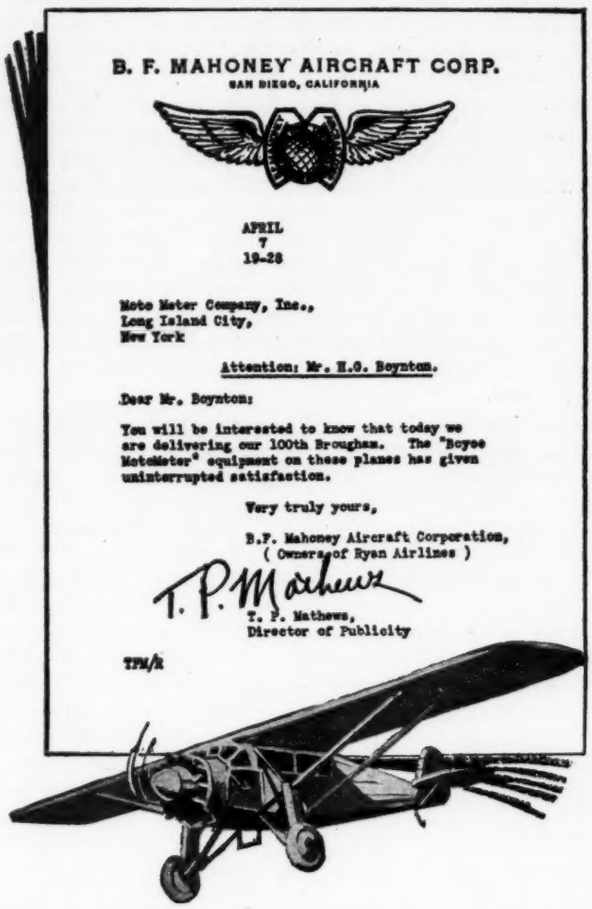
The Fokker F-10

Continued from page 1297

consisting of a rubber chord, in tension, attached to the seat. The seat locks in any desired position and should it be too high, the occupant releases the catch and the rubber chord stretches, slowly lowering the seat until it is in the desired position, where it is locked in place. Should the seat be too low, the occupant raises himself slightly, taking his weight off the seat and at the same time releasing the catch. The tension in the rubber chord raises the seat until it is in the desired position, where it is again locked. The seat on the right is not adjustable, as the plane is intended to be flown, under ordinary conditions, from the left side.

Side view of the F-10 showing the full length cabin windows.

The relief pilot, on the right, also acts as mechanic, radio operator, and perhaps steward for the passengers. For this reason the main flight instruments are mounted on the left side of the instrument board. These include a Pioneer turn and bank indicator, Pioneer altimeter, Consolidated magnetic compass, and Pioneer air speed indicator in the center of the instrument board. The space on the right is devoted to the fuel system controls, while in the center are the



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APRIL 7 19-28

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T. P. Mathews,
Director of Publicity

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And Mr. Mathews' letter of April 7, as shown above, naturally gives a great deal of satisfaction also. Yet, to paraphrase a well-known slogan, we can say no more than "A good 'plane deserves good instruments."

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engine controls and instruments for the center engine. Below the center of the instrument board are all the engine controls, grouped together so that they can be moved together or separately.

The side engines have their instruments mounted on small panels on the inner side of the engine nacelles, below the wing. The panels are fitted with lights, so that they can be seen at night. These panels are plainly visible through small windows in the cowling at the side of the cockpit. The cowling of the cockpit fairs into the wing, with the sides and roof of flat safety glass. The panes can be slid in their frames so that the pilot can have better vision, if necessary, in bad weather. However, vision forward, upward, and to the sides is excellent. Looking downward, the pilot can see the wheels when landing and if necessary can open the cowling to look to the rear.

Goodyear tires 44 in. by 10 in. are mounted on Sauzedde wheels fitted with roller bearings. The track between the wheels is 15 ft. 8 in., which is amply wide for a plane of this size. In addition, the wheels are fitted with brakes so that the plane can be maneuvered on the ground in a very small area. The brakes are individually operated by two handles, one for each wheel, mounted below the instrument board in the cockpit. The handles are attached to cables leading to the brakes. Each wheel, with the brake built in, is supported by three struts; two are hinged to the lower fuselage longerons, while the third, containing the shock absorbers, is vertical and attached to the forward wing spar. The shock absorber unit consists of three vertical members, two of which are welded to the wing. Endless rings of Russell shock absorber chord are laced between these members to transmit the load from the wheel to the wing. As there is no initial tension in the rings, they can easily be replaced. The shock absorber has a long stroke and is said to be exceptionally soft in taxiing. This type of landing gear also has the advantage of having the wheels carry the load of the wing and the engine nacelles directly when the plane is on the ground. Fenders are provided above each wheel to prevent dirt or stones from being thrown into the propeller.

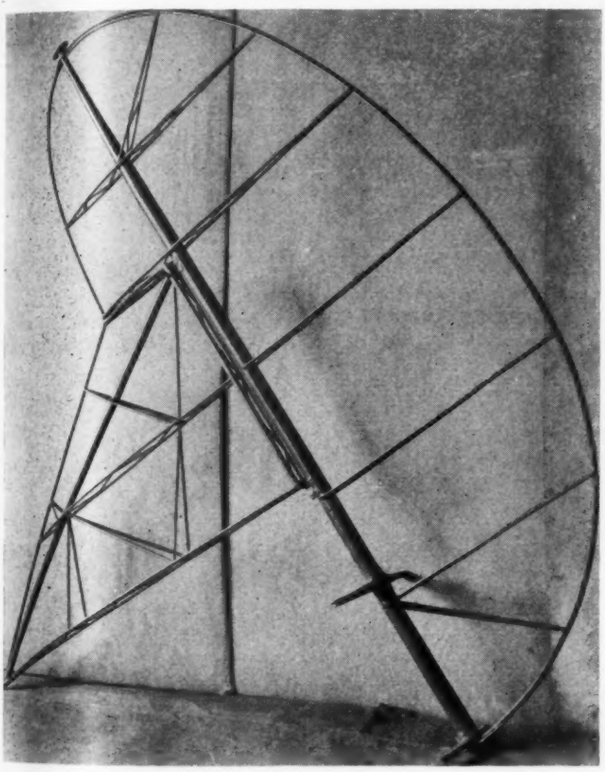
The engine nacelles are each mounted outside the vertical strut of the landing gear, with this strut forming part of the trussing of the engine mount. The engine mount distributes the load to the forward and rear wing spars by a frame consisting of four longerons of steel tubing, welded together and braced by other tubes connecting it to the wing. There are

Front view of the new Fokker F-10.

two points of attachment on the forward spar and one on the rear spar. A ring type of engine bearer is welded to the front end of this truss and circular steel tubes are welded to the bracing members to form the frame for the attachment of the sheet duralumin covering. The nacelle is well streamlined and the engines are fitted with a radial type of shutter to fair the engine as well as regulate the cooling.

The engines are Pratt & Whitney Wasps developing 400 hp. at 1900 r.p.m. They are nine cylinder, direct drive, air

cooled radials fitted with three-blade Standard Steel propellers. It was found necessary to use three bladed propellers to get three proper clearances. Behind the engines, and set into the nacelle so as not to destroy the streamline form, is the exhaust ring. It has two openings at the bottom for the exit of the exhaust gases. The gases of the center engine are carried below the fuselage with the rear portion of the exhaust pipe fitted with an air scoop. Air enters the scoop and comes in contact with the hot exhaust pipe before passing into the cabin. Each engine is fitted with an Eclipse hand inertia starter and in addition there is one booster magneto in the fuselage controlled from the instrument board. It is fitted with a selector switch so that it may be used in starting any of the engines. Behind each engine is a fire wall separating it from a 10 gal. oil tank. The fire walls in the outboard engines are each set in the nacelles diagonally, running from the forward end on the inner side, to the rear end on the outer side. On the inner side of each engine nacelle, passing through the fire wall, is an air scoop taking in air that passes over the oil tank, thus cooling the oil. The



Uncovered fin and rudder of the Fokker F-10.

nacelle has an opening of about four inches in diameter on the rear to permit the exit of this cooling air. The center engine is provided with a copper coil inside the cowling to cool the oil.

Standard equipment on each engine includes an engine driven pump to draw gasoline from any of the three 95 gal. tanks to the engines. The fuel system normally works by gravity, but in addition to the engine pump there is, as an added precaution, a wobble pump in the cockpit operated by a lever between the pilots' seats. Two of the fuel tanks are mounted in the center section, one above the other, while the third tank is mounted in the wing, to the right of the fuselage, between the wing spars. This tank is fitted with a large dump valve.

The wing is of standard Fokker design and is of the same size as that used on the standard Fokker C-2 transport, though it is somewhat heavier to carry the greater load. It is entirely of wood construction, devoid of all wire bracing. Two

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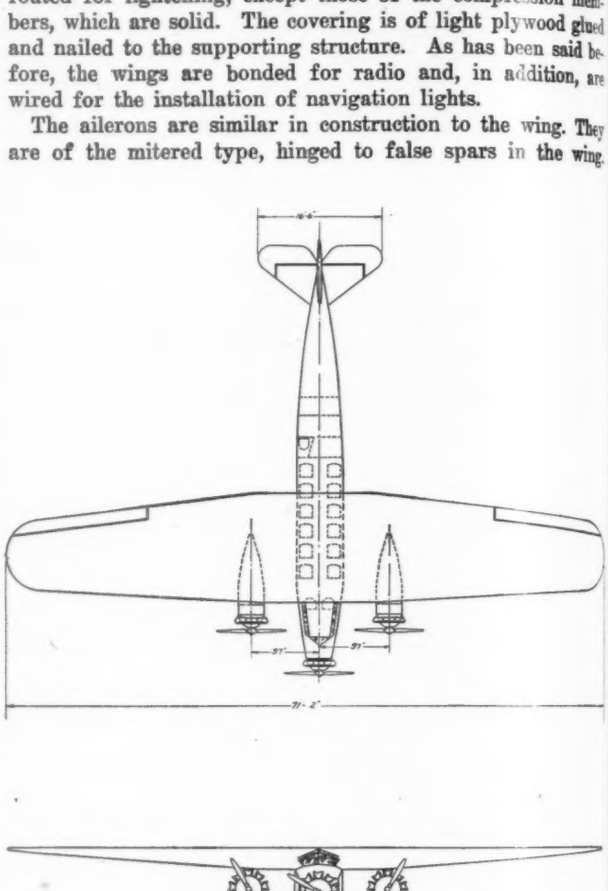
main spars are of the box type with laminated chord members and birch plywood webs. To provide for the taper of the wing in thickness, the number of laminations of the chord members is decreased towards the tips. The ribs have plywood webs with solid cap strips and all of these webs are routed for lightening, except those of the compression members, which are solid. The covering is of light plywood glued and nailed to the supporting structure. As has been said before, the wings are bonded for radio and, in addition, are wired for the installation of navigation lights.

The ailerons are similar in construction to the wing. They are of the mitered type, hinged to false spars in the wing.

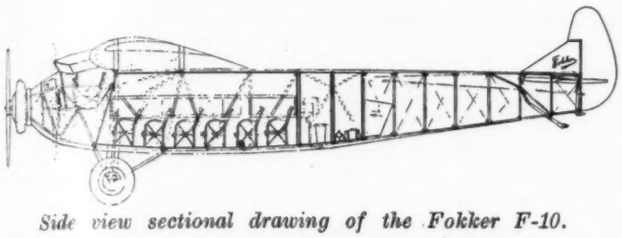


Three view drawing of the Fokker F-10.

The hinges are on the upper surface of the wing and both the aileron and the wing have flat surfaces on the sides facing the gap between them. Thus, when the aileron is up, there is a definite opening in the lower surface, increasing the drag, and when the aileron is down, the gap is closed, decreasing the drag. Horns are attached to both the upper and lower surfaces of the ailerons and connected to cables running to the cockpit. In addition, there is a check cable attached to the upper surface, preventing the aileron from being lowered too far.

Cables are also used for the control of the tail surfaces. They are carried inside the fuselage, with inspection covers provided at all critical places in the system. The cables penetrate the covering at a point near the tail and continue in the open to the control horns that provide the leverage for the operation of the control surfaces. The horizontal stabilizer is adjusted by a handle in the cockpit, between the pilots' seats, connected by cable to a worm gear actuating a bell crank. The stabilizer is attached to this bell crank.

Both elevators and rudder are balanced, and only a single rudder is used. All of the tail surfaces are of welded steel tubing covered with fabric. In general, the surfaces consist of a large diameter tube forming the main structural member to which tubular ribs, of Warren truss construction, are welded. These ribs are braced by another tube bent to conform with the outline of the control surface. The horizontal surfaces are of semi-cantilever design, while the vertical surfaces are internally braced. This type of construction is very light and can be produced very cheaply.

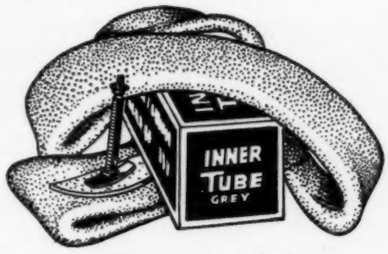


Side view sectional drawing of the Fokker F-10.

The following specifications on the Fokker F-10 were supplied by the engineering department of the Atlantic Aircraft Corp.

Length	50 ft.
Height	12 ft. 8 in.
Span	73 ft.
Maximum chord	12 ft. 6 in.
Area of wings	677 sq. ft.
Area of ailerons	41 sq. ft.
Total area	718 sq. ft.
Airfoil	Fokker
Area of stabilizer	33 sq. ft.
Area of elevators	32 sq. ft.
Area of fin	6.5 sq. ft.
Area of rudder	19 sq. ft.
Weight empty	6,550 lb.
Pay load:	
12 passengers, 180 lb. each	2,160 lb.
Mail, express or baggage	480 lb.
Total pay load	2,640 lb.
Pilots, 2, 180 lb.	360 lb.
284 gal. of gas	1,720 lb.
30 gal. of oil	230 lb.
Disposable load	4,950 lb.
Gross weight	11,500 lb.
Engines	Wasp, 3 at 400 hp.
Wing loading	16 lb. per sq. ft.
Power loading	9.35 lb. per hp.

	3 engines	2 engines
High speed (sea level)	148 m.p.h.	122 m.p.h.
High speed at 12,000 ft.	138 m.p.h.	104 m.p.h.
Cruising speed at 1650 r.p.m.	125 m.p.h.	85 m.ph..
Landing speed	55 m.p.h.	55 m.p.h.
Service ceiling	18,000 ft.	11,000 ft.
Absolute ceiling	20,000 ft.	13,000 ft.
Climb (sea level)	1,420 f.p.m.	640 f.p.m.
Climb (10,000 ft.)	690 f.p.m.	150 f.p.m.
Time to climb 5,000 ft.	4 min.	
Time to climb 10,000 ft.	10 min.	
Time to climb 15,000 ft.	19 min.	
Cruising range	4 hr. or 600 mi.	



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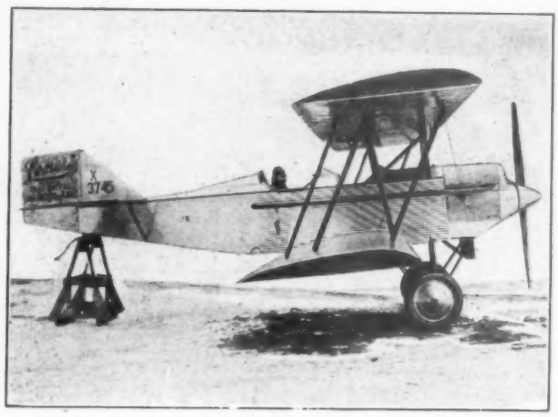

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hereby invites and will receive until 12 o'clock noon, Thursday, August 9th, 1928:

(One) Competitive designs for a rigid airship of approximately 6,000,000 cubic feet volume. Designs to be submitted in accordance with section 10, A to H inclusive, of the Aircraft Procurement Act approved July 2, 1926 (44 stat., part 2, page 780). Price for designs and bid for constructor of one and of two rigid airships to be submitted in accordance therewith as provided in subsequences A, B, and E, of Section 10 of said Act;

(Two) Bids for one and for two experimental rigid airships of approximately 6,000,000 cubic feet volume, parts and accessories; and

(Three) Proposals for construction of one and of two rigid airships in accordance with Navy Department's specifications.

Circulars giving full detailed information may be had on application to the Navy Department, Bureau of Aeronautics. Curtis D. Wilbur, Secretary of the Navy, April 18, 1928.

Side Slips

By ROBERT R. OSBORN

It hardly seems worth while writing anything for this issue of AVIATION, or for the next few to come, as the probability is great that the magazine will be torn up along with hundreds of others and numerous newspapers and telephone directories, to celebrate a welcome to any one of several groups of successful fliers. Not that we're complaining, y'understand. Most of these flights have hit us at a time when we were beginning to think there wasn't another thing in the world to write about, and that "this airplane business" wasn't worth saving.

• • • •

Mr. R. A. of Flyers, Inc., Albany, N. Y., points out that the scheme of placing paraffin on the wings of the Bremen may have helped to prevent the formation of ice, but finding an item in his local paper to the effect that the plane was perfectly "steam-lined", he thinks this may have had more to do with it.

This is a natural mistake for the reporter to have made, but the noise he took to be escaping steam, was the baron composing poetry in the after cabin.

• • • •

It takes something startling, like the flight of the Bremen, to show how much aviation has progressed in a few years. It is reassuring to realize that there are enough planes in the United States so that there could be plenty of exhibits at the Detroit Air Show, and still allow equipment for the thousands of relief and rescue expeditions that started for Greenely Island.

• • • •

Our idea of real tough luck would be to battle through six blizzards and seven fogs to Greenely Island, make a hazardous landing, make a hair-raising take off and battle through seven blizzards and eight fogs to Murray bay. Then have the film roll of pictures you took at Greenely Island rushed by airplane and record-breaking railroad runs to New York, then to realize that when you took those pictures on that camping trip last summer, you neglected to have the film developed.

• • • •

A famous author announces that he will leave shortly for the Austral Islands in the Far South Seas. He is taking with him writing materials for a two year stay, a motion picture camera, and two other cameras. He claims he's going down there to write a book and a play, but our bet is that he has a hunch that the next trans-oceanic or trans-polar flight will land there, and he'll be all set to cash in big on the publicity.

• • • •

Dr. H. Shapley, director of the Harvard Astronomical Observatory has just announced that the center of the Universe is 52,000 light years away from the Earth, or about 300,000,000,000,000,000 miles away. In other words, this old earth, of which we have always been so proud is only a Greenely Island after all, and probably will never get on the front pages of the Universal dailies, unless a non-stop flier from Betelgeuse to the North Star mistakes us for a steamer frozen in the ice.

• • • •

Slang has become so widely used lately that it is even creeping into the pages of our most dignified newspapers and magazines. When we saw the heading "Migratory Bird Bill is Adopted" in one of the staid old newspapers we read nearly half of the news item before we realized it had nothing to do with the Department of Commerce regulations.

FOREIGN NEWS

By Special Arrangement with the Transportation Division Bureau of Foreign and Domestic Commerce

Three New Companies Formed in Canada

Three new companies, according to recent reports, have been formed in Canada. They are the Reid Aircraft Co., Ltd., of Montreal; the General Airways, Ltd., with headquarters at Toronto; and the Northern Aerial Minerals Exploration, Ltd., of Toronto.

The Reid company, which is planning a large plant at Montreal, will manufacture and sell commercial airplanes. The General company is chartered to carry on business as manufacturers, dealers, and transportation line operators, while the Northern Minerals firm is authorized to establish service lines and flying schools.

New Solo Flight to Australia Begun

A solo flight from London to Sydney, Australia, was recently begun by Wing Comdr. E. R. Manning, an Australian in the Royal Air Force. Manning is using a light plane powered with a 35 hp. engine. It is similar to that of Bert Hinkler's.

The route Manning has selected differs in its first stages from that of the other England-Australia fliers. Rather than begin his trip by way of Rome and Malta, Manning will first fly to Marseilles and Tunis, Africa. From Tunis he will proceed to Egypt, and the regular route into Asia will then be followed.

Britain Subsidizes Aero Clubs in India

Decision has been made by the British Government to subsidize a number of light airplane clubs in India, and the Aero Club of India and Burma has been appointed to administer and support these clubs in that country. Much work has already been done, and it is reported that flying will begin in Karachi, Bombay, Calcutta, and Delhi as soon as the first "Moth" planes are received. The initial order is for 12 of these planes equipped with the new DeHavilland engine.

Canada Honors Captain Oaks

Capt. H. A. Oaks, former president of Western Canadian Airways who opened large sections of the Red Lake mining area to air transportation, has been awarded the McKee Trans-Canada Trophy for the greatest service done in Canadian aviation during the past year. The Trophy, which is an annual award donated by the late J. Dalzell McKee, was presented to Captain Oaks by Col. the Hon. J. L. Ralston, minister of national defense.

To Build Dirigible Mast in Natal

Grouiville, which lies on the Coast of Natal in South Africa, is to have a dirigible mooring mast, according to reports recently received. A contract for the erection of the mast is shortly to be placed.

It is understood that the mast will be used by the Empire Airship Line, which is planning service from England to India and Australia using the great new R-100 and a sister ship.

New Company Formed in Uruguay

A new company, the Aero Posta Uruguay, has been granted a charter by the Uruguay National Council of Administration. The company will operate planes in passenger, mail, and freight service.

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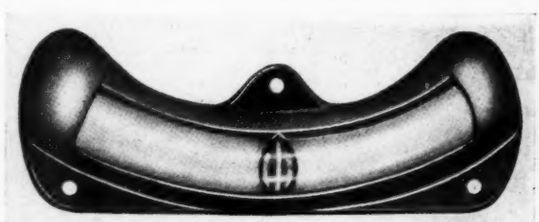

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AIRPORTS AND AIRWAYS

Camden, N. J.

The Crescent Airport, on Crescent Boulevard and Kaighn Avenue, Pensauken, was recently formally dedicated with an attendance of hundreds of guests and visitors who braved threatening skies after a morning of steady rain.

Representing Collingswood, N. J., E. Brown Pardee, president of the Chamber of Commerce, welcomed the Crescent Air Service, Inc., the airport lessee and operator, to South Jersey. Dr. Thomas E. Eldridge of Philadelphia represented the Aero Club of Pennsylvania; Lieut. Victor Williams, chief pilot, and A. N. Chambers, second vice president, represented the South Jersey Aviation Club; Frank M. Weller, harbor master, represented the City of Trenton, and airport commission officials and other civic officials represented Atlantic City, Pensauken and Camden.

Among the visitors were R. Sanford Saltus, Jr., vice president of the Ludington Philadelphia Flying Service, who flew to the Crescent Airport in a Waco 10 and represented the

Crescent Airport, a newly dedicated field near Camden, N. J.

Philadelphia Airport at the dedication ceremonies. The plane was piloted by Wallace Hope, one of the Ludington pilots.

Albert Graham, the Crescent Air Service's new chief pilot, and John J. Stevenson, one of the company's pilots, delighted the crowd with aerial acrobatics. Dozens of passengers were taken for flights, including newspaper photographers, reporters, and news reel men.

Miss Lillian Riedel, daughter of the president of the company and the only aviatrix in the Philadelphia-Camden district, flew near the crowd and showered the visitors with flowers. The guests were welcomed by Frederick A. Riedel Collingswood, president of Crescent Air Service, Inc., Mrs. Lillian Riedel, vice president; Reuben A. Fowler of Philadelphia, secretary-treasurer, and Lieut. Harry Dove, chief instructor.

"Al" Graham, one of the best known barnstormers in this section, has replaced George C. Hand as chief pilot for the Crescent Air Service, Inc., of Camden. Hand resigned recently to become affiliated with a new aviation organization that plans to operate along the coast. Warren Hallowell, another Crescent pilot, also has resigned to take up other aviation work.

Graham will be placed in charge of the Crescent company's operations at Bader Field, Atlantic City's municipal airport. The company is erecting a steel hangar capable of accommodating two planes at the shore. Challenger three place planes (OX-5) are being used at both airports.

Boise, Idaho

By Robert Blackstone

Mayor Walter Hansen has announced that representatives of the Ford Motor Co. had tentatively asked for permission to erect hangars on the municipal airport. It is claimed that Ford plans to bring three large demonstration planes to Boise in the near future.

The Boise Flying Club has sent a letter to the members of the Boise City Council commending that body for its efforts to develop the present flying field by making the east-west runway one mile long overall. The letter was signed by 80 members of the club.

In order to advertise their frolic, the Boise Flying Club, through pilot Roundtree and an Eaglerock, dumped what looked like a human being overboard in the west end of the city recently.

A tripping device scattered this "human" and it came down in the form of dodgers announcing the club's carnival in the Eagle's Hall. Another stunt that Roundtree pulled for the club was to fly low and release a small parachute which let down a box of candy. President Kopke of the club caught it and auctioned it off to the highest bidder.

Some members of the Boise Flying Club want to learn to handle gliders, so the club is going to build two or three and fly them this summer in the foothills north of town.

So many of the club members are demanding flying instructions that a plan is now being worked out to bring in a pilot-instructor, owning a plane and use it for a period of 90 days under contract as a training craft. This plan will not interfere with the buying of a plane by the club.

Manager Charles Wrightson of the Varney Air Lines, points out that Boise is ideally situated to take a national position in the sport of gliding, and that handling of gliders will give valuable training to future pilots.

Extension of the Boise Airport east-west runway has received further encouragement through reports that the American Airways Tour will visit Boise this June on its way to Canada.

Portland, Ore.

By John W. Anderson

The Portland city council got ready to draft a measure regulating actions of aircraft over the city recently only to find that such an ordinance was already on the statutes. City Att. Frank S. Grant unearthed the measure which was passed in 1921. It prohibits several things, including stunt flying over the city, dropping of articles from planes, flying over the denser portions of the city except in going to or from established landing fields and the operation of planes by any but state-licensed pilots.

Portland seems on a fair way to obtaining an upper air observation station as a result of the visit of W. R. Gregg, chief of the aerological division of the Weather Bureau, and T. H. Chapman of the Department of Commerce. Balloon

stations are now in operation at Medford, Ore., and Seattle, Wash. Establishment of such a station in Portland would materially aid fliers on the coast airway, the officials were informed.

Representatives of flying organizations operating in and through Portland were called together at the office of E. L. Wells, district meteorologist, to make suggestions for the benefit of the visiting officials. They were unanimous in their request for the station.

Among those present were Les Hubble, traffic superintendent for the Pacific Air Transport Co. at Pearson Field, Vancouver, Wash.; Capt. L. G. Devaney, chief pilot, and Lieut. Tommy Fowler, pilot, for the West Coast Air Transport Co.; Joseph A. Hill of the Hill Aeronautical School; James H. Polhemus, general manager of the Port of Portland; Lieut. Basil Smith, Rankin Flying Service pilot; Roy J. Davis, Davis-Langman Aircraft Co.; Charles T. M. Nichols, secretary of the Aero Club of Oregon, and Roy A. Wells of the district weather bureau staff.

Planes Search for Rankin's Son

All the planes at Rankin Field were pressed into service recently when 5-year-old Dale Rankin, son of Tex Rankin, head of Rankin Flying Service, and a little companion strayed from home. The planes failed in their search because the boys were found shortly after their disappearance was noted.

Authorization for the establishment of an air mail service between Portland and Yakima, Wash., has been asked of postal headquarters by Postmaster John M. Jones of Portland. According to the request, the service would be given in connection with a daily commercial air service announced by the Rankin Flying Service to start May 15.

William Knight, vice president of the Junkers Corp. of America, visited Portland recently on a tour of the country to study potential sites for an aircraft factory. He was shown factory sites by the local chamber of commerce. The Pacific Northwest, he said, offered many advantages for airplane manufacturers. He expressed enthusiasm over the Port of Portland Airport.

Continental Airways, Inc., has purchased the hangar, shops, offices and field rights formerly held by the Mackenzie-Goff Aviation Co. and has already taken possession. Several improvements to both field and buildings are being made.

Miss Darlyne Barry, 23, of Fairbanks, Alaska, is the first woman student flier to solo in Portland. She made her first flight alone on April 19 at the Mackenzie-Goff Aviation Co. field and the next day was married to George Lingo, manager of the McKinley Transportation Co. of Fairbanks in Seattle, Wash.

Forest Grove, Ore.

The Forest Grove, Ore., Chamber of Commerce has chosen a 2000 by 1000 ft. field about a half mile south of the city for a municipal airport. The selection was made after Lieut. A. B. Mackenzie, president and chief pilot of the Mackenzie-Goff Aviation Co. of Portland; L. E. Therkelson, Portland, district governor of N.A.A. and M. F. Wright, of the Pacific Airport News, had gone over the ground with the chamber of commerce committee.

The site will be either purchased or placed under long-time lease by the city. Adjoining property is suitable for addition to the field in case it is needed.

Salem, Ore.

Warning was served on Salem, Ore., recently by A. P. Talioferro, airway extension superintendent for the Department of Commerce, that the Pacific coast airway would pass the city by unless it established an airport within the next few months. Silverton, Ore., has already laid out a landing field and it will be designated as an official emergency landing

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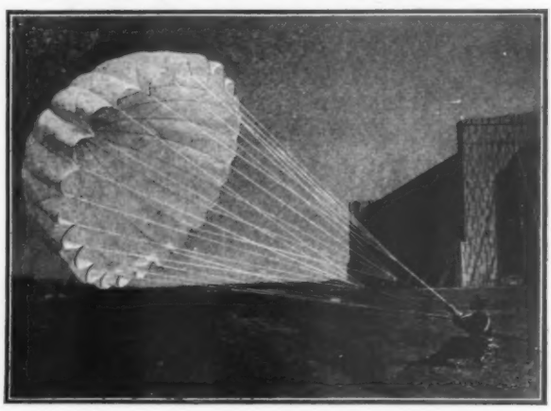

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Dandy covered JN4 lower wings $85.00 each. Upper Canuck or JN4 covered wings $90.00 each. Standard lower covered wings $110.00 each. Standard upper covered $150.00 each. Canuck upper covered allerons $15.00. Canuck lower covered allerons $12.50.

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place unless Salem, which is the state capital, acts. Mr. Talioferro is surveying the route between Portland and Roseburg, Ore.

Toledo, O.

Toledo's delegation to the All-American Aircraft Show in Detroit consisted of representatives from the local chamber of commerce, Mayor William T. Jackson, and Finance Director Earl L. Peters. The chamber of commerce was represented by its president, Adam Kuhlman, James Aitken, chairman of the aeronautical division, and B. H. Bonnar, secretary. Tentative negotiations were opened with the heads of several aircraft manufacturing companies looking to locating them in Toledo in the near future.

Officials of the France Stone Co., Kenton, O., are considering the use of airplanes for transportation of company men to various quarries around the state. The company has leased 40 acres of land near Kenton and turned it over to the city for use as a municipal airport. No charge was made to the city. The property is part of the Stone company's reserve.

A drive to establish a municipal airport in Fistoria, O., has been started by the Earl Foust Post, American Legion. A suitable landing field is desired before the coming visit of Ruth Elder, who will stop there on her cross-country tour in June.

Roy Knabenshue, former Toledoan who startled the world in 1910 by landing and taking off his small dirigible from the roof of the Spitzer Building, spent a few days visiting here recently. Roy now lives in California.

Flying service will be established this summer between Toledo and Catawba Cliffs, a summer resort. J. H. Nickerson, president of the Lake Shore Aviation Co., Port Clinton, will be in charge. Thirty minute service to the resort will be given. The company plans on using an LS5 equipped with pontoons. The craft will be flown between the Toledo Yacht Club and the Catawba Beach Club.

Twelve Contractors Submit Figures

Bids for construction of the first hangar at Toledo's transcontinental airport will be opened soon. A dozen contractors have submitted figures. The hangar will be 80 by 100 ft. and of most modern steel and wood construction.

Flying enthusiasts in Defiance, O., have organized a flying club. A pilot will be hired and a training plane purchased. A campaign for a municipal airport also will be started as soon as the club's plane arrives.

Headed by Mayor Ellis E. Jones, a delegation of Lima, O., city officials recently flew to Detroit to escort Clarence D. Chamberlin back to their city. Chamberlin returned in his flivver plane. A reception was held in his honor and his plane was mounted on a truck and driven through the city streets. The Mayor previously had issued a proclamation setting aside the day as "Chamberlin Day".

The Tiffin,. O., Chamber of Commerce has just been notified that it officially is listed by the Department of Commerce. This was done after the city had painted its name atop the Ohio Power Co.'s building in accordance with Department of Commerce regulations. Mayor John Barry, manager of the Cleveland Airport, is scheduled to address the Tiffin Chamber of Commerce soon as the beginning of a municipal airport campaign.

Cincinnati, O.

By Harold Norman Loeb

Notification has been received in Cincinnati that proposals for bids to light the Louisville-Cincinnati-Cleveland air mail route would be advertised by the Commerce Department, Washington, according to F. C. Hingsburg, airways division chief. "The survey for the route is complete, maps and data sheets have been prepared, and proposals for the lighting

equipment are now to be requested as a final detail," Hingsburg said.

Several months ago, the Continental Airways Co., which holds the contract to carry air mail over the route, announced that the line would be opened by April 1, but so much technical work was involved and such difficulty encountered in getting proper emergency landing fields that Hingsburg now says the line cannot be opened before August 1.

"It will take us four months to install the lighting system after the contracts have been awarded," he said. Regular stops on the route will include Cleveland, Columbus, Akron, Dayton, Cincinnati, and Louisville. In addition, the department has located nine emergency fields for emergency and weather stops. "All these sites have been licensed and engineers are staking out the fields for the beacons and other improvements," Hingsburg said. In all, 38 beacons will be installed on the 345 mi. of the airway.

Worcester, Mass.

By Henry T. Ford

M. Whitin Whittall has been invited by Robert L. O'Brien, state inspector of aircraft, to become a member of the Massachusetts Advisory Aviation Board. Mr. Whittall has stated that he will accept the offer which will give Whittall Field representation in the conduct of aviation in this state. Mr. Whittall has been closely identified with aviation in Worcester for several years and was one of the pioneers in the movement for an airport in this city. He is treasurer of the Worcester Airport, Inc., owner of Whittall Field, and is a licensed pilot. He is owner of a Fairchild cabin monoplane.

Whittall Field has been made ready for the summer flying season and indications are that it will be most successful. Patriot's Day, observed as a holiday in this state, saw more than 2,000 people gathered at the field watching the fliers. Passenger carrying business was good although a strong wind was blowing. Lieut. Stewart Chadwick, piloting a Waco 10 biplane, carried most of the passengers.

The Worcester Flying Club, which has received a Waco 10 to be flown by its members, most of whom are pilots or students, has leased a 100 acre lot in Oxford, nine miles west of Worcester, and will operate it as an airport during the summer months. The club pilot, Fred Desjardins, will be employed to carry passengers and also as flying instructor. There is much interest in aviation in the section and on a recent warm Sunday passenger carrying business exceeded all expectations. J. Henry Reynolds of Worcester is president of the club.

A Well Equipped Hangar

James P. and M. Whitin Whittall recently took possession of their new hangar at Whittall Field which is considered one of the most elaborate in New England. The hangar space is 65 by 30 ft. and is large enough to house a Waco 10, Fairchild plane, and a Driggs-Dart II, all owned by the Whittall boys. An addition to the hangar contains a large office, machine shop, kitchenette, sleeping quarters, locker room with shower baths and a heating plant.

Fifteen students are enrolled in the flying course at Whittall Field most of whom have done some solo work. On account of the condition of the field during the spring there was little flying except by experienced pilots. Win Sargent, Federal flying inspector for New England, has received several applications for tests for limited licenses which will be given in May and June. Inspector Sargent on a recent visit expressed himself as well pleased with the progress of the students and the condition of the aircraft.

Matthew P. Whittall, his two sons, James P. and M. Whitin, and John W. Lasell of Whitinsville, all of whom are officers of the Worcester Airport, Inc., attended the aircraft show at

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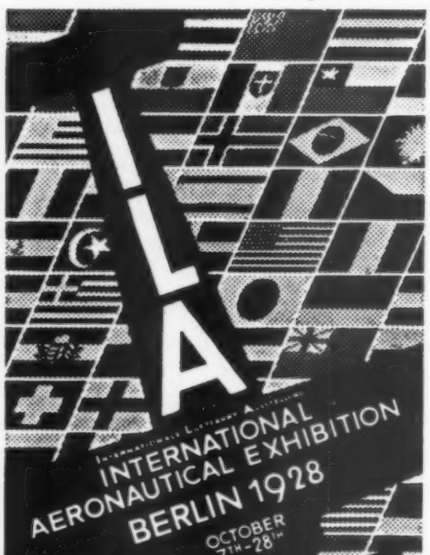

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Detroit. Matthew P. Whittall made the trip to inspect three-engined planes which might be used by the Whittall Associates, rug manufacturers in this city.

Springfield, Mass.

By Charles Hanson Gale

H. N. Parker, president of the Massachusetts Airways, Eaglerock agent here, and P. N. Hall, secretary of the Westfield Chamber of Commerce and one of the most ardent backers of the Barnes Airport at Westfield, motored to Detroit for the aircraft show. Mr. Parker had conferences with B. F. Mahoney relative to the delivery here in May of the Ryan Brougham for which his company will be New England agent.

Donald McClench, member of the flight committee of the Flying Club of Springfield, attended the show as representative of the club in an inspection of a suitable type of plane for the club to use for student training.

Edward P. Warner, assistant secretary of the Navy for aeronautics, declared at a recent meeting of civic clubs at Northampton near here that Northampton lies in a key position in the future development of airways in this section of the country. Considerable interest has been displayed in aviation in Northampton especially in support of the air mail courier service and the statement of the secretary aroused further interest in local aeronautical development.

The Flying Club of Springfield recently announced it would make its headquarters this year at Dunn Field, Longmeadow, pending the development of a municipal airport. The club is investigating a series of makes of planes suitable for club purposes.

Philadelphia, Penna.

Among the pilots who flew to Murray Bay and Greenely Island so that newspaper photographers might "cover" the Bremen story were Robert P. Hewitt, manager of field operations at the Philadelphia Airport, and John Busher, a pilot-mechanician. They took off in the Fairchild cabin monoplane of the Ludington Philadelphia Flying Service and hopped to Old Orchard, Me., later going to Quebec so that their plane could be equipped with skis. From Quebec, Hewitt piloted the plane to Murray Bay and joined the other pilots sent to the scene by newspapers and newspaper syndicates.

The Ludington Philadelphia Flying Service has received the fifth carload of dismantled Waco 10's of its spring-summer order, bringing the total to 25 planes. Sixty Wacos were orderd by Charles Townsend Ludington, company president. The planes are being delivered in carloads of five at the Pennsylvania Railroad tracks in South Philadelphia, near the airport.

Several of the Pitcairn Mailwings (PA-5's with Wright Whirlwind engines) being used on the New York to Atlanta air mail service, have been equipped with experimental radio equipment by the Bureau of Standards of the Department of Commerce, Washington. Test flights to check the accuracy of the apparatus and to accustom the pilots to its operation have been undertaken. A light weight short wave receiving set with a highly selective circuit is being used.

Lloyd Yost, piloting a Fairchild cabin monoplane, was a recent visitor to the Philadelphia Airport. He was en route from his operations base at Pinehurst, N. C., to the Wright factory at Teterboro, N. J., on business.

After a two hour trip from Buffalo to the Philadelphia Airport, the last of three Curtiss O-11 observation planes assigned to the 28th Division Air Service, P.N.G., was flown here recently by Lieut J. J. Gallagher, engineering officer of the squad. He was accompanied by Lieut. W. O. Ilgenritz, adjutant.

A Pitcairn Mailwing was the first airplane to clear from the Port of Philadelphia for a foreign port. It was delivered

to T. J. Tudhope, Squadron Leader of the Canadian Royal Air Force, and will be used in Canada for mapping work. Later it may be used in air mail service.

Chester, Penna.

Col. Charles A. Lindbergh, Comdr. Richard E. Byrd, and Vice Pres. Charles G. Dawes have accepted invitations to attend the annual observance of Military Day here under the auspices of the Sergt. Alfred Stevenson Post of the American Legion, June 2.

Commander Byrd is expected to fly here from Bolling Field, Washington. Announcement that the aviators and Mr. Dawes had accepted invitations to attend the celebration was made recently by Dr. John S. Eynon, in charge of arrangements.

Armonk, N. Y.

Emerging from the inactivity of the winter months, Barrett Airways, owner and operator of the Armonk field, have ordered the continuance of the construction work that was left off last fall when the cold weather set in. The runways, which cross at nearly right angles, are being graded, rolled and seeded. There are now engaged in this work about a dozen men and a couple of tractors. The obstacles which hindered early last year have all been removed.

Leo Terletzky, chief pilot and manager, and Dan Barrett, one of the owners, have devoted a lot of their time and energy to this field, which not so long ago was only an empty lot with a great deal of wooded area in and around it. The hangar, which was constructed by Truscon and housed only two planes last year, is now crowded to the doors. Nine planes have been in the hangar at one time.

One of the most interesting events recently was the assembling and the first American test flights of the little Klem-Daimler monoplanes. These planes are small, 20 hp., low wing monoplanes imported from Germany by George Kern and Walter Seypelt, both of whom made a 6,000 mi. journey around Europe last fall in one of these planes, crossing the Alps three times during the trip. Quite a bit of excitement was created by the sight of these planes on the field, and more particularly in the air. The performance is quite exceptional for the horsepower, and the sound of the two cylinder engine was like a "buzz", making an OX-5 seem, in comparison, like a roaring Liberty.

A Fokker C-2 cabin biplane is also housed in the hangar. This belongs to Mr. Gunther, a photographic expert now doing some work for Hamilton Maxwell of New York City.

There is about the field a hum of real summer activity, and Mr. Terletzky is very optimistic about the coming season. He has reported that 5,000 people were at the field on a recent week-end. Dan Barrett hopes to be able to make a formal announcement of the official opening of the field within the next couple of weeks. The field lies eight miles north of White Plains, just slightly east of the Kensico reservoir and dam. The operations office is marked with name Armonk on its roof, and municipal authorities of the town have agreed to paint the name Armonk on the roof of the school house near by.

Oklahoma City, Okla.

By Ernest W. Fair

A huge circular marker has been placed at the local municipal field. It is 100 ft. in diameter and has been placed about the center of the field. A 12 in. trench of circular shape was dug—this was filled in with coarse gravel which was whitewashed. Fliers say that these markers can be seen for three or four miles from a height of 1,000 ft. Inside the circle a huge cross is to be constructed on the ground to mark the north-south and east-west directions of the field. The grounds of the field are being reconditioned because of the increase of flying activities. The runway is to be coated with 100 barrels of oil to make it waterproof and keep it

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solid during spring rains. The field is also to be dragged and leveled. A. E. Warner is chairman of the field and equipment committee in charge of the work.

Oklahoma City is to have a plane in the fourth Ford Reliability Tour. Paul Braniff, who flew an Eaglerock, the Oklahoman, in last year's tour, has entered the Oklahoma Aero Club's Stinson-Detroiter in this year's tour.

Hundreds of autos lined the municipal airport to watch Bob Cantwell perform with his Lockheed monoplane here. Cantwell, now in the service of Earle Halliburton of Duncan, oil operator and oil field inventor, has been flying in Oklahoma since the world war. The plane was recently purchased by Halliburton.

Landing fields which will accommodate large multi-engined planes will be provided soon on air lines leading into Oklahoma City from all directions, according to plans of El Reno and Guthrie. These cities are working on developing better fields. At El Reno arrangements have been made for a field to be used jointly by the government and by the city. Guthrie has arranged for a field one half mile long north and south and a quarter mile east and west, Loren A. Hutchinson, secretary of the chamber of commerce, has announced. The new field is located on state highway No. 33.

Milwaukee, Wis.

By H. C. Brunner

The Wisconsin Flying Club's new Lincoln-Page biplane, powered with an OX-5, was flown recently from the factory at Lincoln, Neb., to Milwaukee by Elmer Franeke, pilot of the club, with Frank Bartis, treasurer, as passenger. The distance covered was 525 mi. and was made in 5 hr. 10 min. flying time. The club is composed of 12 members each owning an equal share in the corporation.

An American Eagle biplane, piloted by Lieut. H. R. Mull, of the 106th Observation Squadron of the Alabama National Guard, and carrying N. J. Bond, was a recent visitor at Maitland Field. Mr. Bond is making a survey of airports throughout the Middle West with a view toward establishing commercial air transportation.

Mrs. John Fell, "flying grandmother," landed at the county airport recently after traveling 2,100 mi. by air to visit her daughter in Milwaukee. Mrs. Fell's home is in Sydney, Australia, and she had arrived recently in San Francisco from Australia. The entire distance from Oakland to Milwaukee was negotiated in 25 hr.

The "Maiden Milwaukee", a Fairchild, and a Ryan monoplane carried 12 passengers recently to Detroit for the All-American Air Show in that city. The Fairchild plane was piloted by C. B. Chamberlain and carried Elling O. Weeks, president of the Weeks Aircraft Corp. and owner of the plane, M. S. Kingston, Arthur Pitz, and Walter Piepenhagen. The Ryan plane was piloted by Elmer Leighton and carried Carl Walters, Rudolph Pabst, Fred Ellis, and William Brumder. The Maiden Wilwaukee was piloted by John Miller with Thomas Hamilton, president of the plane company, with William Pabst and Eugene Gilhausen as passengers.

Salt Lake City, Utah

The city commission has voted $6,500 for improvements on the local airport. This was done on the recommendation of Harry L. Finch, city commissioner of parks and public property. His estimates called for nearly $2000 more, but after considerable discussion it was agreed to keep the expenditures within $6500. Of this sum, $1747.90 will be spent for a sewer; a water main will cost $789.25; drain ditches, $427; oiling of field, $1800; cesspool, $200; comfort station, $1000; backfill sewer, $520; cinderng, surfacing and painting $2000.

The air express service to St. Paul, Minneapolis, and Indianapolis added to the lists of the American Railway Ex-

press Co. brings the total of cities on air express lines to 30, Mr. Gehan, general agent for Salt Lake, says. He also said that Salt Lake is now in seventh place in the number of air express shipments handled. Salt Lake was ahead of such cities as Oakland, Dallas, Boston, Kansas City, Omaha, and Oklahoma City, he reports.

Salt Lake City, pivot point in the Western airways system, has been included as a stopping place of the first all-American air tour, a 35 day trip covering all the principal cities of the United States and Canada, and also touching Mexico and Cuban points, according to word received recently from the American Airways Tour, which is engineering the project.

In addition to pilots, navigators, and managers, 206 passengers will be carried in 25 multi-engined planes. This air tour will leave Washington, D. C., June 15 and will end July 20 at the take off point. Something more than 10,000 mi. will be covered.

Minneapolis, Minn.

By H. A. Lindbergh

The Arrowhead Aircraft Co., Monocoupe distributor in Minnesota, South Dakota, and Montana, expects a demonstrator plane during the latter part of May, that is to be used in the various flying activities here.

Shortly after the franchise was received in January, the Central States Aero Co. of Davenport, Ia., former manufacturer of the Monocoupe, was reorganized, which handicapped the dealers and distributors as no planes were available. The Mono Aircraft, Inc., of Moline, Ill., is producing the Monocoupe at present and has included a number of improvements in its construction. A new engine is also under production and is considered as being successful according to the various tests. Elliott H. Griffin is the manager of the Arrowhead Aircraft Co. and Wm. Day Prindle is the chief pilot.

The *Minneapolis Journal* is sponsoring a model building and flying contest that is of interest to the youthful aviation enthusiasts in Minnesota and several neighboring states. Merrill Hemburg, an instructor in the public schools of Detroit, Mich., and secretary of the Airplane Model League of America, is giving instructions through the pages of the *Journal* on the fine points of constructing the miniature planes.

Two of the winners in the contest, the date of which is not definitely decided, will go to Detroit to compete in the national meet. Leading pilots and others actively engaged in some branch of commercial aviation have endorsed the tournament and are offering their assistance in making it interesting to all concerned.

Los Angeles, Calif.

By Charles F. McReynolds

Dycer Airport added two new planes to its equipment during the past month and the purchase of a Whirlwind Ryan plane is now contemplated. The latter would be used for advanced training purposes.

Walt. and Ed. Higley of Longement, Colo., well known auto racers, recently soloed at Dycer Airport. They have flown back to Colorado to establish an airport. An L6 Standard they bought from Charles Dycer will be used at their new field.

Vancouver, Wash.

Two Portland, Ore., police officers made their first parachute jumps at Pearson Field here recently. Both are members of the 321st Observation Squadron, Air Corps Reserve. They dropped from a plane piloted by Lieut. Oakley G. Kelly, commander of the field. Seth Davison, deputy constable, was blown out over the Columbia River and dropped 200 ft. from shore. He managed to loosen himself from the 'chute and swim to land. Jack Tauscher, traffic officer, had

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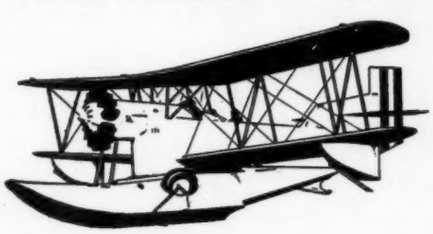

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better luck and landed flat on his back and uninjured in the middle of the field. Davison dropped 1500 ft. before pulling the cord to open his parachute, Kelly said.

Lieuts. A. C. Smith and Wentworth Goss of Crissy Field, San Francisco, landed at Pearson Field recently in a Douglas O-2-C Army plane equipped with radio instruments. They remained several days demonstrating radio cooperation between air and land troops.

The Bush Flying Service of Vancouver has just established a branch school at Silverton, Ore. About 20 students have enrolled there, according to W. C. Bush, head of the company.

Reno, Nev.

The selection of another field for use as a Reno airport instead of the present inadequate one is the center of agitation again. Many are demanding that the city get busy and inaugurate a municipal field in a more favorable locality than the present one.

It is pointed out that the present field is right under Mount Rose and that the city side of this mountain is full of gullies and canyons and that taking off into an east wind, means a crack-up if a failure occurs for there is no place to land.

Then, in case of a west wind, landing is hazardous for there is a 23 ft. drop in this 1200 ft. runway. This is the spot where Colonel Lindbergh was forced to ground loop the Spirit of St. Louis while making 45 m.p.h. in order to avoid parked cars. There is an upper 1300 ft. of this runway, but it is worthless because of two ditches flowing diagonally across it. These ditches have, of course, been covered with planking, but the roughness of the field and approaches to the planks are poor. A redeeming feature of Reno's present airport, however, is the north-south runway of 2500 ft. which is in fairly good shape. By giving the airplane the gun from in front of the hangar a safe take off is easily possible.

Washington, D. C.

Washington's first aero club has just been organized here by a group of aviators and aviation enthusiasts at the call of Jesse C. Duke, chairman of the District of Columbia division of the United States Air Force Association. A charter has been obtained under the name of the United States Aero Club, Inc.

Col. J. Edward Cassidy, United States Army Air Service, and Capt. O. A. Reed, Army Air Service Reserve Corps, outlined the purposes of the club. More than 20 persons formed the nucleus of the new organization, which will seek its membership by a city-wide campaign to be inaugurated in the near future.

Mr. Duke was named chairman of a temporary group which will serve until the club officers can be regularly elected. The temporary office of the club will be at 710 Fourteenth Street, N.W. It is proposed to acquire a plane and a landing field as soon as the membership reaches 30.

E. L. Rice, local inventor, demonstrated his new airplane engine which recently was exhibited to officials of the Navy Department.

Richmond, Va.

With the growth of aviation tending in the direction of greater load-carrying capacities and larger and more heavily loaded aircraft, the City of Richmond has decided to increase the size of its municipal airport, the Richard E. Byrd Flying Field, at Fort Lee. Mayor J. Fulmer Bright has signed an ordinance authorizing the appropriation of $18,000 for improvements at the field.

The airport is operated by Pitcairn Aviation of Virginia, Inc., a branch of Pitcairn Aviation, Inc., with headquarters in Philadelphia. It is planned to increase the north and south runway to 3,800 ft. and the east and west runway to 2,500 ft. These now are 2,000 ft. in length. The prevailing wind blows north and south.

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WANTED: NEW production ship; three place with or without motor. Prefer Hisso, but will take OX-5 or OXX-6. Up to $2000.00 cash for good Hisso motored ship. Also need good A or E Hisso motor complete. E. F. Dutro, Zanesville, O.

WANTED: IN good condition, Fairchild, Stinson-Detroiter, Ryan, Bellanca or similar plane, also pontoons. Give prices for cash and full description in first letter. Box 874, AVIATION.

WANTED: USED Jenny near Manitoba. Must be in good condition. State lowest price first letter. G. Wells, 538 Sherbroocke St., Winnipeg, Manitoba, Canada.

WANTED: USED 3 place new production ship in good condition. Give full details and price in first letter. Box 877, AVIATION.

WANTED: UPPER and lower wings, right side, for 1927 Air King. Must be in perfect condition. Catskill Mountain Airways, Inc., 796 Broadway, Kingston, N. Y.

WANTED: A three place ship, Swallow, Travel Air or Waco. Must be a bargain. State price and condition of ship in first letter. Kohlert's Aircraft, St. Charles, Ill.

WANTED: USED low powered sport monoplane, also two cylinder Lawrance motor. State lowest cash price. P.O. Box 209, Bowling Green, O.

WANTED: USED new production ship; trade for Chrysler 80 sedan. Beautiful shape every way. Cost new $3640.00. Will sell $2100.00. H. C. Gordee, 48 No. Laramie Ave., Chicago, Ill.

HELP WANTED

WANTED: EXPERIENCED welder on fuselage in airplanes. Expert engine mechanics with license. Also cabinet maker. No amateurs wanted. Apply Revelation Aircraft Co., Bridge Plaza South, Long Island City, N. Y.

PILOTS WITH transport licenses, also licensed mechanics for regular air lines, preferences given Fokker, Wright Whirlwind men. State experience, salary, etc. The Elliott Air Service Limited, Hamilton, Ont.

TRANSPORT PILOT with full knowledge of Liberty motors. Must be in position to take care of motor in emergencies away from airport. References required as to ability, integrity and honesty. A real job, good for 12 months of the year for the right man. Box 866, AVIATION.

HAVE OX-5 Standard near New York City. Wish to communicate with aviator to fly for sport on Sundays. Box 873, AVIATION.

MISCELLANEOUS CLASSIFIED ADVERTISING

JUST OUT—Book and blue prints on design, construction and operation of small sport plane. Contains lessons in flying also. All for $1.00 postpaid. Chas. E. Russell, 545 Stadium Place, Ft. Wayne, Ind.

ATTENTION PLANE manufacturers. I have a modern Pease continuous blue printing machine to trade on OX light biplane. C. B. Malcolm, Roanoke, Va.

ATTENTION PILOTS—OWNERS: If you own a ship that can be licensed and have no place to fly and make money come to Hackensack, N. J. You can operate here on 50-50 gross basis. We furnish field located on crowded highway, only one hour's ride from Manhattan, all advertising, gas, oil, ticket sellers, ballyhoo and all passengers and students you can fly. If necessary we secure transport pilots for your ships. Bergen Skyways, R.F.D. 1, Hackensack, N. J. Attention Mr. J. R. James. Tel. Leonia 1922.

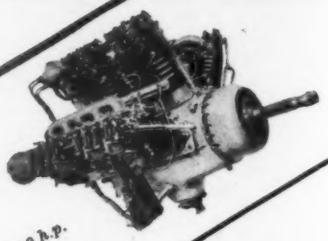
I HAVE 20 years experience in airplane prop manufacture and need capital to supply the great demand sure to come. Own exclusive wood and metal propeller designs. Best of references. Lets get together and cash in. Box 876, AVIATION.

LARGE PACIFIC Coast trade school, engaging in aeronautical work, requires services of competent instructor to take complete charge of aeroplane rebuilding department. We have an attractive proposition open to one who can meet our requirements. This offer merits the investigation of the better type of men. Investment required. For particulars address Box 878, AVIATION.

WILL TRADE: Two moving picture theatre projectors and small equipment complete, excellent condition, for OX-5 Jenny or what have you? Aubrey Barnes, Chanute, Kans.

EXCEPTIONAL OPPORTUNITY to secure control of going air transport line. Company operating mail and passenger service in ideal territory needs $100,000.00 additional American capital for purchase of equipment to handle present business and for extension. Several months in operation. Fine prospects and will stand strict investigation. Would consider the providing of tri-motor six to twelve passenger transports or amphibians of the Loening type, hangars, etc., as part of cash investment. This is a going concern with pioneering work finished and has a big future. You must mean business and act quickly to be considered. Box 872, AVIATION.

The enterprise of "Lorraine" is an assurance of constant progress toward more powerful and more reliable aircraft.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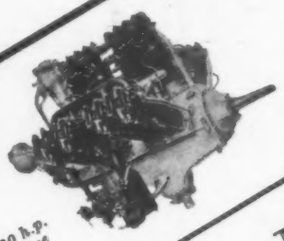
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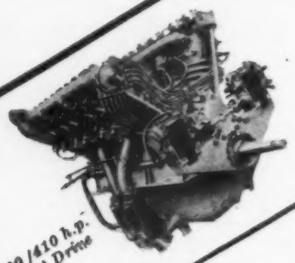
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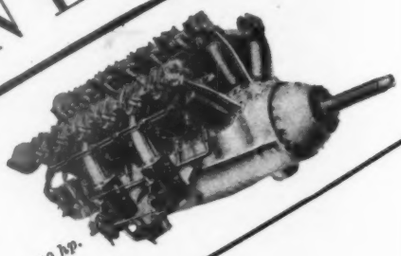
LORRAINE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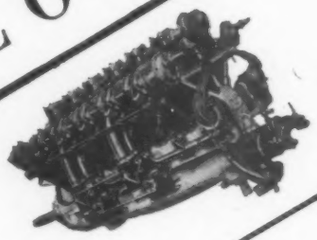
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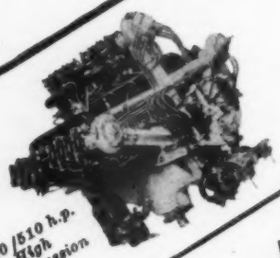
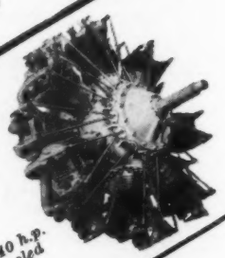
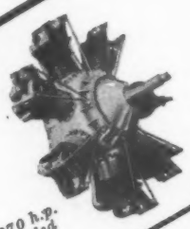
Aircraft Engines


480/510 h.p. High Compression


470/540 h.p. Air Cooled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More than 5,000 engines are in service through out the world. They have been fitted to all the different types of planes and have established themselves through their remarkable reliability. In actual use they have more than equalled the remarkable successes which they have had in the brilliant long distance flights of the past few years.

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WE HAVE recently completed a new booklet on commercial aviation, entitled "Now that man has wings."

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GREAT records are made with the Wright Engine: the reward is the popular comment—"That must be a good engine."

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"A good engine"—alone it carries on for hours without missing, for miles without stopping. "A good engine"—seemingly without fatigue, a power-plant that knows no exhaustion, whose performance is so consistent that it seems to have no limits.

"A good engine"—but back of that popular comment is a story of conception, design, workmanship, assembly, tests by the hundred, and infinite care to every detail that makes a good engine, not by chance, but by deliberate intention.

Wright Engines were born in the Great War and reared in the atmosphere of successful air activities. Their tests came every day. They proved their ability in the vital ebb and flow of war necessity. Their performances helped make "aces" of pilots whose names are still remembered.

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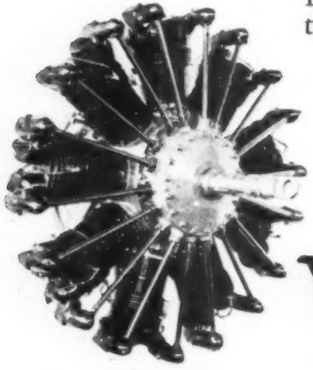

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That's why More Pilots fly them!

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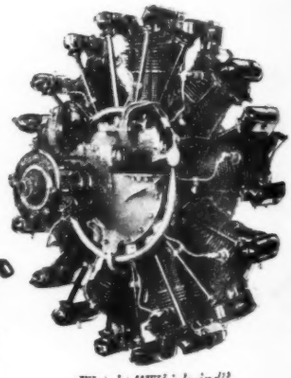

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